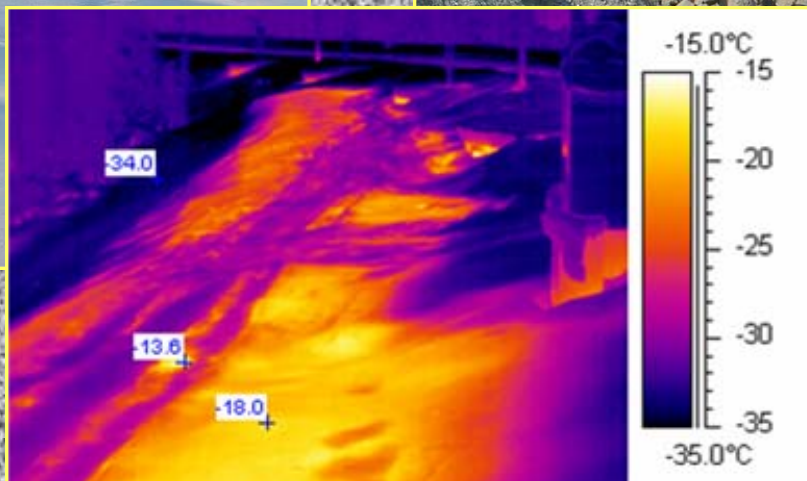
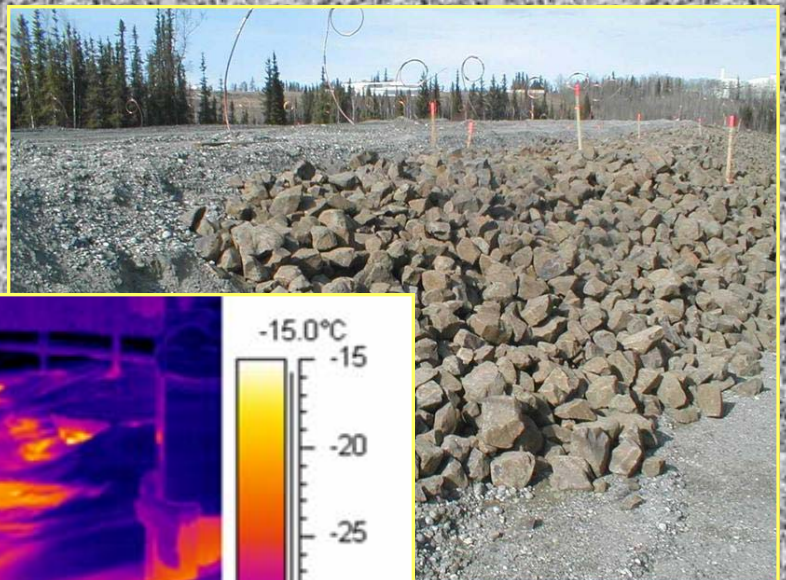


# Statewide Research & Technology Transfer FFY 2004 Annual Report



**Alaska Department of Transportation & Public Facilities  
Statewide Design & Engineering Services Division  
2301 Peger Road  
Fairbanks, AK 99709-5399**

[www.dot.state.ak.us/stwddes/research/index.shtml](http://www.dot.state.ak.us/stwddes/research/index.shtml)  
(907) 451-5320





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# ADMINISTRATIVE

## Introduction

The Department of Transportation and Public Facilities Research and Technology Transfer Program (RTT) is funded through the Federal Highway Administration's State Planning and Research Program, Local Technical Assistance Program, Surface Transportation Program, and State matching funds.

Research staff conducts and oversees research projects on behalf of the department. Through the research staff, the department also maintains reciprocal activity with the national and international transportation research community to obtain research findings that may have application in Alaska. Research results go to appropriate department staff, local agencies, and the public through publications, training, and other means. Research staff also actively work to implement research findings.

The RTT program includes the department's Local Technical Assistance Program (LTAP), also known as the Technology Transfer (T2), and the Border Technology Exchange Program (BTEP). While these programs are also funded by FHWA, they focus on technology transfer to local governments and the Yukon Territory.

The LTAP program also manages the National Highway Institute (NHI) training program which provides federal and state matching funds to sponsor technical training for department employees.

RTT program goals:

- Improve procedures, techniques, materials, and equipment used by the department to plan, design, construct, operate, and maintain state transportation systems and facilities.
- Ensure the improved procedures, techniques, materials, and equipment are implemented within the department and in local communities.

- Advance safety.
- Use state and federal resources efficiently.
- Ensure that transportation systems are constructed and operated with minimal adverse effect on the environment.
- Construct, maintain, and operate facilities at the lowest life cycle cost.
- Protect the department's capital investments.

Nearly all department research reports and current research projects can be found by going to <http://www.dot.state.ak.us>:

1. select scroll box "Program, Plans, Projects"
2. double-click on "Research & Tech"
3. under Research & T2 select "Resources (Libraries)" and follow the search instructions.

DOT&PF's research reports are also found in the Transportation Research Information System (TRIS). Their searchable web address:

<http://ntl.bts.gov/tris/>. They can also be found by going to <http://ntl.bts.gov>.

Hard copies available upon request



## ADMINISTRATIVE

### Research Continues Contracting Procedures On Line

The procurement process for professional research services are available on line. Research project RFPs are now found at: [www.dot.state.ak.us](http://www.dot.state.ak.us).

The online RFPs have links to Information and instructions for preparing research proposals, which

- lists requirements for preparing and submitting RFPs, and
- describes the contracting procedures.

The online process applies only to research projects eligible for State Planning and Research funds.

Alaska law excludes acquiring research-related equipment and services from its procurement regulations. To avoid potential conflicts of interest and abuse, implemented a fair and objective process to

### Research Administration

**Project Number** 01-01

**Project Manager:** Billy Connor

**Cost FY03:** 408,500

**Completion Date:** Project is renewed annually

The budget for Research Administration is based on the anticipated cost of operating the research program.

hire research contractors.

The research contracting procedures are based on the experience collected by the National Cooperative Highway Research Program (NCHRP). We developed our procedures from two of NCHRP's guidance documents:

1. Procedural Manual for Agencies Conducting Research in the National Cooperative Highway Research Program, and
2. Information and Instructions for Preparing Proposals.

NCHRP developed these documents from its many years of expertise in administering a national applied research program. Both documents are available at:

<http://www4.trb.org/trb/crp.nsf>.

This account provides for:

- Research staff salaries
- Research staff salary and travel not connected to project
- Soliciting needs statements/selecting projects
- Travel for Research Advisory Board
- Early project development
- Miscellaneous expenses ( supplies etc..)



## ADMINISTRATIVE

### **Research Reports added to RTT Library 2003— February 2005**

<b>Title</b>	<b>Report Number</b>
Single Lane Live Load Distribution Factor for Decked Precast/Prestressed Concrete Girder Bridges	FHWA-AK-RD-04-03
Scoping Analysis to Assess the Effects of Roads in Alaska on Habitat Quality and Connectivity	FHWA-AK-RD-04-01
Development and Validation of Urban Rutting Models	FHWA-AK-RD-04-02

**Available on-line: [www.dot.state.ak.us/stwddes/research/search\\_lib.html](http://www.dot.state.ak.us/stwddes/research/search_lib.html)**



## ADMINISTRATIVE

### Research and T2 Staff & Research Advisory Board

## Research and Technology Transfer Staff

Clint Adler, P.E., Research Engineer.....	451-5321
Billy Connor, P.E., Research Manager .....	451-5479
Linda Gavin, Administrative Clerk.....	451-5320
Simon Howell, Training Specialist .....	451-5284
Steve Saboundjian, P.E., Implementation Engineer.....	451-5322
Dave Waldo, LTAP Manager .....	451-5323
Fax .....	451-5340



## Research Advisory Board

### Voting Members

Tom Briggs, Deputy Commissioner of Marine Operations AMHS .....	465-3902
Gary Hogins, P.E., Chief Engineer, Design & Engineering Services, Chair .....	465-6958
Kip Knudson, Deputy Commissioner of Aviation.....	465-0724
John MacKinnon, Deputy Commissioner of Highways & PF .....	465-3900
Andrew Niemiec, P.E., Northern Region Director .....	451-2211
Jeff Ottesen, Division of Program Development .....	465-6971
Gary Paxton, Southeast Region Director .....	465-1763
William Robertson, Central Region Director .....	269-0555
Steve Boch, P.E., FHWA.....	586-7427

### Non-Voting Members

Billy Connor, P.E., Secretary .....	451-5479
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# ADMINISTRATIVE

## Research Work Program Budget

### PART A: ADMINISTRATION, TECHNOLOGY TRANSFER AND CONTINUING PROGRAMS

Project Number	Work Item	Project Totals	Estimated Completion Date	Page Number
01-01	Research Administration	408,500	ongoing	4
01-02	Implementation of Completed Research	60,000	ongoing	NA
01-03	Research Response Program	155,464	ongoing	NA
01-04	Pooled Fund Studies	60,000	ongoing	48
01-05	Experimental Features Evaluations	25,000	ongoing	60
01-06	NCHRP Program Support	380,000	ongoing	10
01-06	AASHTO DUES	30,000	ongoing	
01-06	TRB Dues	86,000	ongoing	9
01-06	Border Technology Exchange Program	15,000	ongoing	66
01-06	National Highway Institute	483,000	ongoing	65
01-06	Technology Transfer Program Support	280,000	ongoing	62

### PART B: COMPLETION OF EXISTING STUDIES

Project Number	Work Item	Project Totals	Estimated Completion Date	Page Number
T2-04-01	Aggregate Abrasion Using the Nordic Ball Mill Test	30,000	12/05	42
T2-02-08	Bed Material Retention Buried Invert Culverts	60,000	12/05	22
T2-02-05	Design Manual for Air Cooled Embankments	60,000	6/07	16
T2-03-04	Design of Pipe Attachments for Culvert Headwalls	30,000	9/05	23
T2-01-20	Development and Validation of Urban Rutting Models	50,000	6/05	35
T2-01-07	Development and Verification of Fish Barrier	100,000	5/05	21
T2-02-14	Development of Pavement Design Manual	110,000	extended	38
T2-01-03	Development of Rapid Wetland Assessment Model	30,000	7/05	15
RT-0002	Effectiveness of Paving Airborne Particulate Matter	1,900,000	12/06	14
T2-02-04	Eliminating Longitudinal Cracking	40,000	6/05	17
T2-01-13	Enhancing Estimating Procedures	40,000	7/05	44
T2-03-08	Evaluation of Solid Oxide Fuels at Alaskan RMS Sites	NA	closed	30
T2-03-11	Evaluation of Alternate Embankment Construction	25,000	9/05	37
T2-03-05	Evaluation of Avalanche Detection	26,000	6/06	27
T2-02-01	Evaluation of Corrosion Resistant Concrete Reinforcement	NA	cancelled	13
T2-02-22	Evaluation of Detectable Warnings in Alaska	20,000	6/05	47
T2-03-06	Evaluation of DGPS Guidance for Snowplows	100,000	closed	28
T2-01-26	Evaluation of Effectiveness of Rumble Strips in Alaska	30,000	completed	46
T2-02-16	Evaluation of LiDar as Data Acquisition	20,000	9/05	41
T2-03-15	Evaluation of Lighted Crosswalks	30,000	9/05	45
T2-01-01	Evaluation of Live Load Distribution Factor	75,000	completed	11
T2-01-09	Evaluation of Remote Control Avalanche Equipment	110,000	closed	26





# ADMINISTRATIVE

## Research Work Program Budget (continued)

<b>PART B: COMPLETION OF EXISTING STUDIES (continued)</b>				
<b>Project Number</b>	<b>Work Item</b>	<b>Project Totals</b>	<b>Estimated Completion Date</b>	<b>Page Number</b>
T2-03-02	Experimental Study on Seismic Retrofit	110,000	7/05	12
T2-03-09	Floating Donut Rubber Fender Testing	50,000	9/05	31
T2-01-21	High Float Surfacing for Gravel Roads	50,000	9/05	36
T2-99-07	High Temperatures of Alaskan Asphalts	10,000	9/05	32
T2-03-13	Implementation of Asphalt Mix Designs	20,000	9/05	33
T2-03-07	Mitigation of Drifting Snow at Pipeline Crossings	15,000	6/06	29
T2-01-10	Reliability of Remote Weather Observation Systems	NA	closed	24
T2-03-12	Theoretical Density Determination with Nuke Gauge	15,000	9/05	40
T2-03-16	Training for Contracting Warrant System	52,500	ongoing	39
T2-01-04	Updating DOT Geotech Procedures	25,000	9/05	18
T2-02-18	Use of Modified Asphalts	40,000	9/05	34
T2-04-02	Use of Rubber in Hot Mix Asphalt to Reduce Rutting	50,000	6/05	43
T2-99-02	Verification of Roughness Coefficients	88,000	7/05	19
<b>Experimental Features</b>				
T2-99-04	Magnet Snowplow Guidance System	5,000	closed	25
AK 99-03	Rockfall Barrier Mitigation		completed	61
AK 01-02	Ventilated Shoulder Design Features		in progress	61
<b>Pooled Fund Studies</b>				
SPR-3(042)	Aurora Program	ITS	ongoing	49
SPR-3(076)	Animal - Vehicle Crash Mitigation	50,000	9/05	55
TPF-5(009)	Computer Based Self Operating Training	30,000	not set	56
SPR-3(091)	Development of the Advanced Rotary Plow for Snow Op.	10,000	completed	52
TPF-5(013)	Effects of Multiple Freeze Thaw Cycles	20,000	9/05	56
TPF-5(087)	Electronic Appraisal Development Study - Phase 1	10,000	8/06	59
SPR-3(096)	Fish Passage Capability	120,000	12/06	54
SPR-3(094)	Pavement Marking Life Cycle	20,000	12/05	53
SPR-2(208)	Pavement Subgrade Performance	10,000	12/05	56
TPF-5(073)	Portable Non-Intrusive Technologies	20,000	9/05	58
SPR-3(072)	Strength and Deformation Analysis of MSE Walls	20,000	12/04	50
TPF-5(064)	Western Alliance for Quality Transportation Construction	0	2007	57
SPR-3(007)	Wiremesh and Cablemesh Slope Protection	10,000	12/04	51



## ADMINISTRATIVE

### TRB Dues

**Project Number:** 01-06

**Estimated Completion Date:** Project is renewed annually

**Estimated Cost FY 03 :** \$86,000

**Project Manager:** Billy Connor

#### **Project Description**

The Transportation Research Board (TRB) is a unit of the National Research Council under the National Academy of Sciences. This program

- promotes the publication of transportation research results
- hosts annual meetings each January in Washington, D.C., for research presentations and discussions
- sponsors committees of researchers active in specific fields
- distributes Transportation Research Records and other publications to all member states

This project funds Alaska's annual contribution for support of the Transportation Research Board. It enables Alaska to receive distributions of all TRB publications, with individual copies of each to all interested personnel in the department. It also provides for unlimited literature search services through the Transportation Research Information Services (TRIS) and listings of abstracts on any transportation-related topic at no additional cost to the state. Finally, it provides travel cost reimbursements to all TRB committee chairmen in return for their services at annual committee meetings and free registration for all DOT&PF employees who attend TRB's annual meetings.

No personnel costs are involved in this project account. This account provides the mechanism for paying the annual billing for these services.

The TRB executive board finalizes billing amounts for this program in January, and state participation agreements are sent out by TRB in March.

The Transportation Research Information Services database is a computerized information file maintained and operated by the TRB. It is sponsored by FHWA, the Federal Transit Administration, the National Highway Traffic Safety Administration, U.S. Department of Transportation, the fifty state highway and transportation departments, the District of Columbia, Puerto Rico, American Automobile Manufacturers Association, National Asphalt Pavement Association, U.S. Army Corps of Engineers, and Association of Railroads. TRIS covers both U.S. and international research. It contains information on various modes and aspects of transportation, including planning, design, finance, construction, maintenance, equipment, traffic, operations, management, marketing, and other topics. TRIS contains more than 400,000 abstracts of completed research and research in progress.

Services available from TRIS include literature searches, topical searches, and publications: Transit Research Abstracts, Highway Safety Literature, and the quarterly Highway Research Abstracts.

The research staff enters information about the department's active and completed research into TRIS, as required by 23 CFR 420.207(a)(4).

#### **Available Project Reports**

All completed DOT&PF Research reports are available through TRB, as are all research reports from other state highway agencies and from the international community



## ADMINISTRATIVE

### NCHRP Program Support

**Estimated Completion Date:** Project is renewed annually

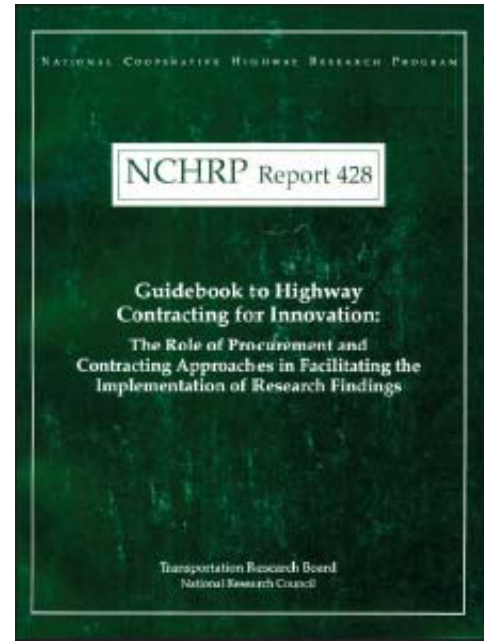
**Estimated Cost:** \$380,000

**Project Manager:** Billy Connor

#### **Project Description**

The DOT&PF supports and participates in the National Cooperative Highway Research Program (NCHRP), a joint program of AASHTO and FHWA. The Transportation Research Board (TRB) administers the program. NCHRP, established in 1962, provides a program of systematic, well-designed applied research. Program funding comes entirely from contributions from state transportation agencies. FHWA recommends contributions of 5.5% of each state's planning and research program (SPR) allocation of federal highway funds. NCHRP contributions do not require the 20% in state matching funds common to other SPR-funded research activities.

NCHRP projects are developed each year. NCHRP solicits ideas for research projects of a national scale from state representatives. State representatives prioritize projects through a voting process. The AASHTO standing Committee on Research (SCOR) selects the final projects. Next, NCHRP solicits interest from national experts in the project area to participate in project panels. The panels develop project statements, solicit proposals, and select research agencies to perform the work. Finally, the participating states vote to select the projects that will be completed with the available funds. The DOT&PF research manager is responsible for coordinating NCHRP project submissions and panel participation.



#### **Available Project Reports**

All reports are available through the Transportation Research Board or the Keith B. Mather Library at University of Alaska Fairbanks.



## BRIDGES & STRUCTURES

### Evaluation of Live Load Distribution Factor in Alaskan Decked Bulb-tee Bridge Girders

**Project Number:** T2-01-01

**Estimated Completion Date:** Completed

**Cost:** \$75,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Elmer Marx, Bridge Design



#### **Problem Statement**

The Alaska Department of Transportation and Public Facilities (AKDOT&PF) commonly uses the Alaska decked bulb-tee precast girder for its bridges. AKDOT&PF designs bridges in conformance with AASHTO Load Resistance Factor Design (LRFD) Bridge Design Specifications.

Because there is a unique longitudinal joint (hinge) between girders for this type of bridge, the current AASHTO LRFD design specifications do not provide an accurate method to calculate single lane-loaded live load distribution factors (DFs). AKDOT&PF calculates single lane-loaded DFs to determine bridge load ratings – the evaluation of live load carrying capacity of a bridge. Lacking a defensible methodology to calculate the single lane-loaded DFs, AKDOT&PF bridge engineers use multiple lane-loaded DFs for load rating. This practice is likely

overly conservative, potentially resulting in more costly bridges.

#### **Research Objectives**

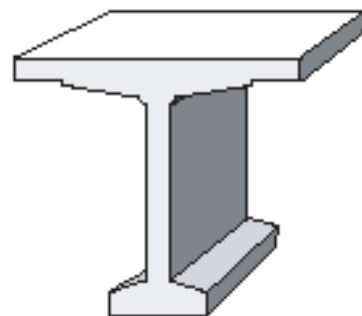
The goal of this project is to produce an accurate methodology for the calculation of the single lane DF for Alaskan decked bulb-tee bridge girders. Subsequent bridge load ratings will incorporate the new single lane DF resulting in greater understanding of load distribution in Alaska decked bulb-tee girders and a more accurate determination of bridge live load capacity.

#### **Project Status**

Completed

#### **Available Reports**

FHWA –AK-RD-04-03, “Single Lane Live Load Distribution Factor for Decked Precast/Prestressed Concrete Girder Bridges”





## BRIDGES & STRUCTURES

### Experimental Study on Seismic Retrofit Techniques for Cap Beams, Columns, and their Connections of Highway Bridges

**Project Number:** T2-03-02

**Estimated Completion Date:** 7/30/05

**Estimated Cost:** \$110,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Elmer Marx, Bridge Design

#### **Problem Statement**

Due to the effect of ice impact on columns, most bridges in Alaska were designed with improper seismic design considerations. Therefore, the columns are often stronger than the cap beams and may fail without warning during a strong earthquake. A recent investigation indicated that there is a high propensity for excessive damage of bridge joints if hit by a major earthquake.

The application of the proposed study will lead to retrofit schemes that will be both efficient and economically competitive. The proposed schemes will address the following requirements; (1) it is rather easy and simple to implement in the field, (2) traffic disruptions are maintained at minimum levels, and (3) it is durable.

#### **Research Objectives**

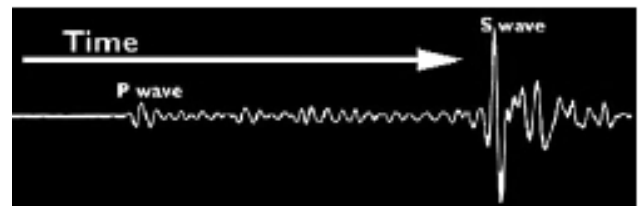
- (1) to experimentally investigate the shear and flexural capacity of cap beams and their corresponding columns that are typical in the states of Missouri and Alaska,
- (2) to study the cyclic behavior of beam-column joints, and
- (3) to develop effective retrofit techniques for the seismic upgrading of the cap beams, columns, and their connections.

#### **Project Status**

The contracted research team completed design, construction, retrofitting, testing and data analysis for test unit 1; partially completed design, construction, retrofitting, testing, and data analysis for test unit 2. Project is on schedule. Anticipated future work: purchase of materials for the retrofit of test unit 2; complete retrofitting, testing and data analysis of test unit 2.

#### **Available Reports**

- Progress report and “Preliminary Analysis



and Test Design” report

- Final at project end





## **BRIDGES & STRUCTURES**

### **Evaluation of Corrosion Resistance of Concrete Reinforcement in Alaska**

**Project Number:** T2-02-01

**Estimated Completion Date:** Cancelled

**Estimated Cost:** NA

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- George Imbsen, Bridge Design

#### **Problem Statement**

The State of Alaska has been using epoxy coated reinforcing steel as the primary measure to counteract corrosion. Recent information suggests that alternate reinforcing steel treatments may provide superior corrosion resistance in Alaska's cold climate and coastal environments.

Definitive comparative studies of the cold climate corrosion resistance of steel reinforcement materials are lacking.

#### **Research Objectives**

Researchers intend to determine the relative corrosion resistance of promising corrosion resistant concrete reinforcement materials in coastal Alaskan environments. Specifically, they intend to compare the following materials:

1. Epoxy coated rebar.
2. Stainless steel clad rebar
3. MMFX steel - (A proprietary microcomposite)

#### **Project Status**

Project cancelled due to unavailable test materials and controlled testing site within project budget.

#### **Available Reports**

- None



## ENVIRONMENTAL

### **Effectiveness of Paving on Airborne Particulate Matter in Kotzebue, Alaska** (Research Response Program)

**Federal Project Number:** RT-0002(143)

**Research Project Number:** T2-02-03

**Estimated Completion Date:** December, 2006

**Cost:** \$1,900,000

**Project Manager:** Clint Adler

**Principal Investigator:**

- Gerry Guay, Air Quality Monitoring Program, Alaska Department of Environmental Conservation (AKDEC)



#### **Problem Statement**

The Alaska Department of Transportation & Public Facilities AKDOT&PF does not have quantitative information on the impact of paving silt-based gravel roads in rural Alaska and its effectiveness in reducing the levels of airborne particulate matter (PM).

Kotzebue, one of the larger cities in northwest Alaska, has undergone a steady population growth over the past 20 years. This growth has resulted in a vast expansion in the local road network. This demand for new roads led to a substantial increase in the number of unpaved

road surfaces as well as an increase in vehicular traffic and airborne particulate matter. This elevation in the level of particulate air pollution is causing Kotzebue residents to experience an increase in respiratory illnesses. "When the air becomes dusty, the number of health problems and hospital visits increase".

#### **Research Objectives**

The objective of this project is to determine if paving a portion of Kotzebue's dirt roads will be effective in reducing the levels of particulate emissions from the road surface due to vehicle traffic and winds. The project will also assess the overall reduction in the concentration of airborne particulate matter in Kotzebue. The goal of this project is to demonstrate a minimum emissions reduction of 65 - 75 % in the vicinity of the road surface and an overall reduction of particulate levels in Kotzebue of 10-20%.

#### **Project Status**

AKDEC installed air monitors and collected air particulate data during the Summer and Fall of 2002, 2003, and 2004. AKDOT&PF will pave streets during the summer of 2005 and AKDEC will monitor air quality through the Summer and Fall of 2006.

#### **Available Reports**

- Interim report available from Project Manager
- Final at project end



## ENVIRONMENTAL

### **Development of a Rapid Wetland Assessment Model for Alaska.** **Phase I: Synthesis of Practice for Rapid Wetland Assessment in Alaska.**

**Project Number:** T2-04-03 (formelyT2-01-03)

**Estimated Completion Date:** 7/30/05

**Estimated Cost:** \$30,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Bill Ballard, AKDOT&PF Statewide Environmental Coordinator
- Carol Sanner - AKDOT&PF Liaison to the U.S. Army Corps of Engineers
- Jim Powell - AK Department of Environmental Conservation
- Robert (Mac) McLean, AK Department of Natural Resources, Office of Habitat Management & Permitting
- Phil North - U.S. Environmental Protection Agency
- Leonard Corin, Bill Pearson, Jerry Tande - U.S. Fish & Wildlife Service
- Jeanne Hanson – U.S. National Oceanic & Atmospheric Administration, National Marine Fisheries Service
- Edrie Vinson – AK Division Federal Highway Administration

**Problem Statement**

Many Alaska Department of Transportation & Public Facilities (AKDOT&PF) projects involve unavoidable impacts to wetlands due to Alaska's unique climate and ecosystems. To satisfy requirements of state and federal environmental laws and policies, and to ensure environmentally responsible transportation planning and decision-making, AKDOT&PF must assess the functions and values of wetlands potentially affected by transportation project alternatives.

No single or standard method exists for assessing wetlands specifically throughout Alaska. Lack of a standardized wetland

assessment method for highway projects in Alaska has resulted in inefficient environmental reviews. Objective, consistent, and effort-efficient functional assessment techniques that reflect Alaska's varied climates and ecosystems are needed. AKDOT&PF needs guidance for development of rapid wetland functional assessment procedure for Alaska's transportation projects.

**Research Objectives:**

- Develop and present a synthesis of rapid wetland functional assessment practices potentially applicable to Alaska.
- Identify data and information needs necessary to develop an Alaskan statewide rapid wetland functional assessment protocol
- Present recommendations for the development of an Alaskan rapid wetland functional assessment protocol applicable statewide.

**Project Status**

Reserch under Contract to HDR Alaska, Inc. Principal Investigator: Anne Leggett, Senior Scientist.

**Available Reports**

- Interim: n/a
- Final at project end



# GEOTECHNICAL

## Design Manual for Air Cooled Embankments (ACE)

**Project Number:** T2-02-05

**Estimated Completion Date:** 6/30/07

**Estimated Cost:** \$60,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Steve Saboundjian
- Billy Connor

### **Problem Statement**

Roadway embankments constructed in areas of warm permafrost (interior Alaska) experience high rates of failure due to thaw-induced settlement of the foundation soils. The problem is most pronounced beneath the embankment shoulders where additional snow cover in winter (due to snow plowing operations) and hot dry conditions during summer conspire to produce mean annual surface temperatures that are several degrees higher than their pre-construction values. Thaw settlement beneath embankment shoulders often causes side-slope instability and the formation of large longitudinal cracks in the asphalt pavement surface with consequent maintenance requirements.

To reduction maintenance costs and improve roadway safety, a new type of thermal treatment that uses an open highly porous rock cover on the shoulder side slope is being investigated. Modeling studies and field measurements will be used to understand the thermal behavior of these ventilated shoulder features and formulate design procedures.

### **Research Objectives**

The aim of this study is to produce a design manual to be used by DOT&PF and private contractors. Data generated with advanced

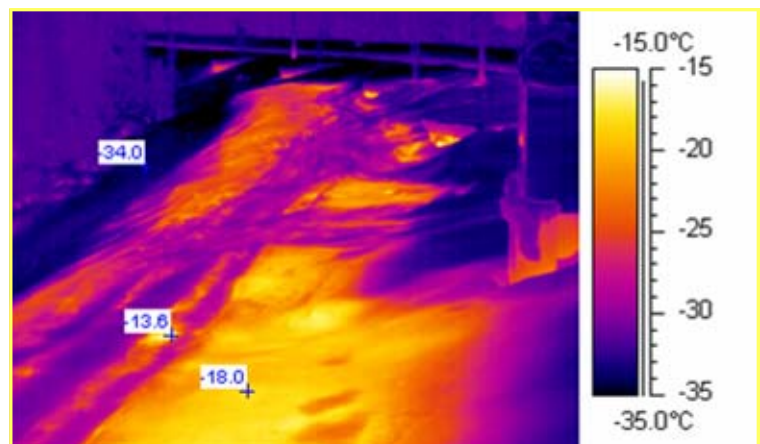
models will be combined with field measurements and synthesized into a set of design guidelines. These guidelines will be incorporated into the design manual.

### **Project Status**

Project started in May 2005, by signing an MOA with the Institute of Northern Engineering at UAF.

### **Available Reports**

- Interim n/a
- Final n/a







# GEOTECHNICAL

## Eliminating Longitudinal Cracking

**Project Number:** T2-02-04

**Estimated Completion Date:** 6/30/05

**Estimated Cost:** \$40,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Steve Saboundjian, Research & T2
- Billy Connor, Research & T2

### **Problem Statement**

Many interior Alaska roads are constructed in regions of warm permafrost and experience a significant rate of failure due to longitudinal cracking. Longitudinal cracking occurs because the permafrost thaws at an accelerated rate at the south slopes of the embankment. The thawing results from high mean temperatures on the side-slope. Two sources cause the higher mean temperatures: (1) thick snow layers in winter, because of snow clearing operations, and (2) relatively high summer temperatures. Foundation soils subsiding beneath the side-slopes causes road shoulders to rotate, creating longitudinal cracking. Deep cracks in the pavement surface result in hazardous driving conditions and frequent maintenance.

### **Research Objectives**

This research examines new techniques to cool embankment side slopes, with the goal of avoiding accelerated thaw and longitudinal cracking. Techniques, similar to the Air-Cooled Embankment (ACE), involve the use of a layer of a uniformly graded coarse aggregate with low fines content and very high permeability. High permeability will allow circulation of ambient air through the shoulder of the embankment during winter, thus providing an enhanced cooling effect. Also, the horizontally embedded thermosyphon technique will be evaluated. If

these techniques prove viable, this project could offer a cost-effective method to avoid longitudinal cracking, improving safety and reducing maintenance.

### **Project Status**

Under contract to Prof. Doug Goering, Mechanical Engineering Dept., UAF.

Instrumentation installation was completed in summer 2004 and temperature data acquisition started in fall 2004.

### **Available Report**

- Interim: Prof. Doug Goering, Mechanical Engineering Dept., UAF, "ACE and Thermosyphon Design Features: Loftus Road Extension Project. Design Analysis, Summary and Instrumentation", Report No. FHWA-AK-RD-02-01, Dec. 2001. Available online at: [http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa\\_ak\\_rd\\_02\\_01.pdf](http://www.dot.state.ak.us/stwddes/research/assets/pdf/fhwa_ak_rd_02_01.pdf)
- Final at project end







# GEOTECHNICAL

## Updating AKDOT&PF's Geotechnical Procedures

**Project Number:** T2-01-04

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$25,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Dave Stanley
- Bruce Brunette

### Problem Statement

ADOT&PF presently uses its own geotechnical procedures manual. The latest version (1993) of the manual is a decade old. The manual is outdated and there are now significant departures of standard procedures from the 1993 manual. Procedures and references for procedures have changed. The geotechnical community has made advances in exploration methods, testing, and evaluation of geotechnical conditions. In this project, it is intended to update the geotechnical manual. This will result in more efficient investigations and analysis of geotechnical conditions. It will also reduce the risk of some construction claims.

### Research Objectives

The main objective of this in-house project is to bring ADOT&PF's geotechnical procedures up to present day industry standards. The manual will consist of introductory comments, then a set of stand-alone guides to cover various topics.

### Project Status

The following guides have already been published:

- *Alaska Field Guide for Soil Classification*
- *Alaska Field Rock Classification and Structural Mapping Guide*
- *Alaska Geotechnical Report Preparation Guidelines.*

Two guides are in final editing and will be published by September 2005:

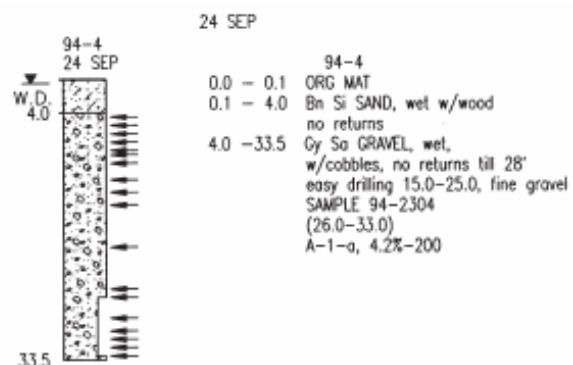
- *Alaska Geotechnical Field Investigations Guide*
- *Alaska Guide to Description and Classification of Peat and Organic Soil.*

Still in progress are:

- *Alaska Material Site Investigations Guide*
- *Alaska Geotechnical Procedures Manual Checklists*
- *A guide to liquefaction analysis and a foundations investigation guide.*

### Available Reports

- Interim: *Alaska Soil Classification Guide.*
- Final n/a





# HYDRAULICS

## Verification of Roughness Coefficients

**Project Number:** T2-99-02

**Completion Date:** 7/30/05

**Cost:** \$88,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Mark Miles, Statewide Hydraulic Engineer



### **Problem Statement**

Sufficient hydrologic information necessary for predicting flood heights and stream flows during spring runoff and flood events is lacking for many Alaskan streams. Inaccurate information can lead to culvert and bridge designs that inadequately prevent wash out, or destructive scour. We start by measuring stream flow and channel data from Alaskan streams over several years. The flows in Alaskan streams often respond differently to precipitation events than streams in the rest of the United States. When designing culverts and bridges, Department Hydraulic Engineers use available stream roughness (friction) coefficients that were developed in "Lower '48" states, mostly in the southeastern United States, where there are few large cross sections and steeper streams. Alaska has many cascading-flow and boulder-cobble streams, particularly in the southeast and

south-central areas, as well as braided glacial streams on the Dalton Highway up to Atigun Pass in the northern, arctic region. To date, Alaskan designers have had to extrapolate roughness coefficients from the Lower '48 data, and experience shows that doing so isn't sufficient to protect our culverts and bridges.

### **Research Objectives**

- Derive better channel roughness estimates for Alaskan streams.
- Improve engineer's computation of flood heights and stream volumes when designing bridges and culverts.
- Improve cost-effectiveness of bridge and culvert designs by more closely matching stream crossing structures with stream flow behavior.
- Reduce stream crossing maintenance costs by reducing scour and washouts.

### **Project Status**

This project supports a continuing United States Geological Survey (USGS) effort to collect a additional hydrologic data on numerous Alaskan streams. Southeast Alaska produced valuable data, with higher than normal stream flows. This allowed Stream Flow Modeling researchers to perform calibration and verification of channel roughness.

Initial results from stream flow modeling indicate that we need higher estimates of roughness coefficients on steep Alaskan streams. Researchers are finding that current, nationally published roughness coefficients tend to lead designers to underestimate roughness and underestimate flood heights on many of Alaska's mountain streams. Continuing research is likely to improve stream channel roughness estimates in Alaska which are critical to effective stream crossing designs. The USGS and AKDOT&PF



## HYDRAULICS

will continue to gather and analyze additional data and refine estimates of stream roughness in Alaska.

### **Available Reports**

- USGS will publish a final report at conclusion of project - estimated June 2005



## HYDRAULICS

### **Development and Verification of an Efficient Fish Barrier Assessment Protocol for Highway Culverts**

**Project Number:** T2-01-07

**Estimated Completion Date:** 5/30/05

**Estimated Cost:** \$100,000

**Project Manager:** Clint Adler

#### **Technical Advisory Committee:**

- Mark Miles, Statewide Hydraulic Engineer
- Bill Ballard, Statewide Environmental Coordinator
- Mac Mclean, AK Division of Habitat Management & Permitting

#### **Problem Statement**

In Alaska, highway culverts may be restricting fish passage in many watersheds. The Alaska Department of Transportation & Public Facilities (AKDOT&PF) currently owns culverts that may restrict or prohibit fish passage. ADOT&PF has established an annual project to retrofit or replace culverts that block or impair fish passage. However, a comprehensive culvert inventory and fish barrier assessment protocol is lacking for efficiently prioritizing and programming fish barrier mitigation.

Efficient resource appropriation, fish barrier mitigation, and habitat restoration are not possible without an accurate culvert inventory and a streamlined culvert assessment and prioritization protocol.

#### **Research Objectives**

Researchers expect to develop and verify a streamlined version of a culvert assessment protocol that the United States Forest Service (USFS) developed as part of their road condition survey for Alaska's Tongass National Forest. A streamlined culvert assessment protocol will give the responsible state agencies the ability to

- rapidly collect sufficient data for use in

identifying culverts that pose fish passage barriers,

- efficiently use computer models to assist engineers and habitat biologists in the design and assessment of culverts for fish passage, and
- prioritize the replacement of problem culverts according to the degree of harm that the culvert poses to fish populations and/or availability of upstream habitat.

Accomplishment of these goals will involve

- streamlining of existing culvert assessment protocols,
- verification of the modified culvert assessment protocol for use with culvert hydraulic models, and prioritization of culvert replacements and retrofits.

#### **Project Status**

During the summers of 2001 and 2002, AKDOT&PF and AKDF&G collected stream data on the Kenai Peninsula and wrote a draft culvert assessment report. AKDOT & PF hired a consultant to review this draft report and recommend methods for improving the culvert assessment protocol. AKDOT&PF hydraulic engineers and ADF&G biologists are jointly developing a method for prioritizing the replacement or retrofit of problem culverts.

#### **Available Reports**

- FHWA-AK-RD-O5-02 Analysis of an Efficient Fish Barrier Assessment Protocol for Highway Culverts

**Project Number:** T2-02-08



# HYDRAULICS

## Bed Material Retention for Buried Invert Culverts

**Estimated Completion Date:** 12/31/05

phenomena.

**Estimated Cost:** \$60,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

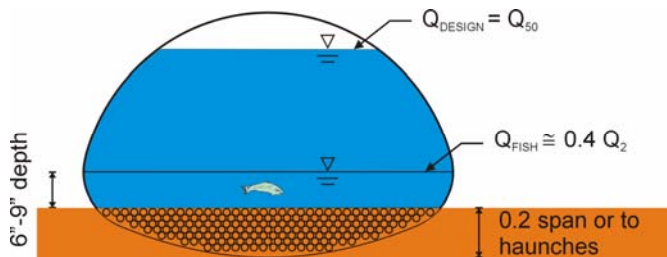
- Mark Miles, Statewide Hydraulic Engineer

### **Project Status**

Negotiating hydraulic flume study with Utah State University.

### **Available Reports**

- Interim: n/a
- Final at project end



### **Problem Statement**

ADOT&PF hydraulic engineers lack design criteria for providing and installing stable bed material in fish passage culverts. A common permit stipulation for buried invert culverts is that the bed material within the culvert barrel remains stable up to the 50-year design flood. This should also include the stability of the streambed material near the culvert inlet and outlet. Existing design methods and criteria do not address streambed material stability in a buried culvert.

Additionally, existing gradation specifications allow sub-bed flow during low flow conditions which may preclude fish passage.

### **Research Objectives**

Provide reference hydraulic parameters and bed material properties useful to:

- Hydraulic engineers in designing and installing stable bed material that allows for fish passage in culverts.
- Researchers investigating culvert scour





# HYDRAULICS

## Design of Pipe Attachments for Precast Culvert Headwalls

**Project Number:** T2-03-04

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$30,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Mark Miles, P.E. AKDOT&PF Statewide Hydraulic Engineer

### **Project Status**

AKDOT&PF Bridge Section is developing design guidelines in-house.

### **Available Reports**

- At Project end



### **Problem Statement**

Little engineering guidance is available to help engineers determine the most effective and economic method for attaching culvert pipe to precast concrete headwalls. Arched pipe culverts have been especially challenging. Considerable engineering effort is expended each year in the review and design of proposed headwall attachment methods. Additionally, field construction has been problematic due to nonstandard and varying methods. Long term performance information is also lacking.

### **Research Objectives**

Determine which attachment designs are optimal in terms of cost, constructability, environmental impact, and performance and develop standard design drawings and specifications for statewide use.



## MAINTENANCE & OPERATIONS

### Reliability of Power Sources for Remote Weather Observation Systems

**Project Number:** T2-01-10

**Estimated Completion Date:** Closed

**Estimated Cost:** N/A

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Jeff Ottesen, Statewide Program Development
- Douglas Lewis, Northern Region M&O

#### **Problem Statement**

Providing cost effective and reliable electrical power to operate remote avalanche-monitoring road weather information system (RWIS) sites along coastal mountain ranges in Alaska is a significant challenge. AKDOT&PF's past attempts at establishing remote, coastal alpine RWIS sites that harnessed solar and wind power in conjunction with battery storage have failed. The power demands of sensor heating elements when combined with the very short winter daylight periods as well as rime ice formation on the wind foils and solar panels reduced power output below what was necessary to recharge batteries. Various engine driven power systems and thermal electric generators fueled by diesel or propane can provide reliable energy but require very large capital investments and have high annual operating costs attributed to on-site maintenance and fuel delivery by helicopter.

Recent developments in power source technologies promise greater reliability yet remain untested and unproven in coastal, Alaskan alpine environments. It is unknown if AKDOT&PF can develop and deploy these new power source technologies cost effectively in coastal, Alaskan alpine environments.

#### **Research Objectives**

The goals of this study are to:

1. Synthesize the state-of-the-art in cost effective power generation systems for remote, alpine RWIS sites that will provide reliable operation on a one-year or longer maintenance cycle in coastal Alaskan alpine environments.
2. Identify barriers to cost effective implementation and suggest techniques or additional research to overcome implementation barriers.

#### **Project Status**

Closed - Project reestablished as Project T2-03-08 "Evaluation of Solid Oxide Fuel Cells"

#### **Available Reports**

- n/a





## MAINTENANCE & OPERATIONS

### Magnet Snowplow Guidance System (Experimental Feature)

**Project Number:** T2-99-04

**Estimated Completion Date:** Closed

**Estimated cost:** \$5000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Jeff Ottesen, Statewide Planning/ITS
- Frank Richards, P.E., Statewide Maintenance Engineer

#### **Problem Statement**

Today, snowplow operators, with the limited visibility caused by winter conditions, often don't know their exact location in the roadway. They have to drive at speeds great enough to effectively remove snow, while remaining alert for roadside obstacles and obstructions. Low visibility and the absence of distinct cues that delineate the road decrease the snowplow's speed and efficiency. Some of Alaska's mountain passes receive more than 14 meters (45 feet) of annual snowfall and suffer whiteout conditions. Consequently, snowplow operators use the guardrail for guidance by riding with the snowplow blade, snugged up against the guardrail. That practice makes clearing the snow from the roadway take more time and wreaks expensive havoc on the guardrail. Maintenance and Operations forces have to replace a lot of guardrail each summer, only to ruin it again over the course of the winter.

One new intelligent transportation system product is a magnetic guidance system (MGS) for vehicles. The MGS is a series of magnetic markers or magnetic strip that serve as a roadway reference, plus vehicle-borne sensing and processing units that obtain information from the roadway magnetic reference.

The Department installed a MGS from 3M Inc.

(3M Lane Awareness System) in a road rehabilitation project in Thompson Pass on the Richardson Highway near Valdez. Thompson Pass has guardrail, some of the highest snowfall in the state, blowing conditions, and low visibility.

#### **Research Objectives**

- Evaluate the 3M Lane Awareness system in an Alaskan coastal mountain pass. The magnetic guidance system should help the operator stay on track, avoid the guardrail, and not veer into the oncoming traffic lanes.
- Safe guidance for snowplows moving up and down a winding mountain pass.
- Reduce snowplow damage to guardrail.

#### **Project Status**

Project closed. AKDOT&PF installed magnetic tape in 3 lanes (2 climbing and 1 descending) of the Richardson Highway in Thompson Pass and retrofitted two Freightliner and two Rotary snowplows with the magnetic sensing and operator interface equipment. Department maintenance personnel discontinued their use of the system after the 2003-2004 winter season due to difficulties with maintaining equipment and system obsolescence.

#### **Available Reports**

- Interim: Unpublished interim report available
- Final: N/A





# MAINTENANCE & OPERATIONS

## Evaluation of Remote Control Equipment for Avalanche Cleanup

**Project Number:** T2-01-09

**Estimated Completion Date:** Closed

**Cost:** \$110,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Frank Richards, Statewide Maintenance Engineer

### **Problem Statement**

Avalanche cleanup operations pose great risks to heavy equipment operators. In Thompson Pass, near Valdez, snowfalls frequently exceed 14 meters (45 feet). The resulting avalanches frequently close the Richardson Highway. There are merely six hours of daylight during the darkest of the winter months, which means cleanup activities happen during times of low visibility. The Alaska Department of Transportation and Public Facilities intended to evaluate the safety benefits of Teleoperated and Automated Maintenance Equipment Robotics (TAMER) remote control equipment for avalanche cleanup operations.

### **Research Objectives**

The objectives of this study were to

- define and quantify any process and safety improvements achieved by employing TAMER on avalanche cleanup operations in Alaska.
- quantify the reduction in road closure time and reduced worker exposure to hazardous conditions that result from using the TAMER technology, and
- document ways to optimize remote controlled avalanche cleanup operations under conditions of extreme cold and extended hours of darkness.

### **Project Status**

The Department retrofitted a single 2000 Case 921C loader with the TAMER equipment in 2001 for use during Alaskan avalanche cleanup operations.

Due to bankruptcy, the TAMER vendor did not deliver a critical remote camera, rendering the remote control system ineffective for avalanche cleanup operations.

### **Available Reports**

- None





## **MAINTENANCE & OPERATIONS**

### **Evaluation of Avalanche Detection/Warning Device**

**Project Number:** T2-03-05

**Estimated Completion Date:** 6/30/06

**Estimated Cost:** \$26,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Terry Onslow, Central Region M&O

#### **Available Reports**

- Interim n/a
- Final at project end

#### **Problem Statement**

Recent advances in acoustic sensor technology promise increased reliability in detecting snow avalanches. To be effective, researchers must use the equipment to identify unique acoustic and seismic characteristics of avalanches. This avalanche "fingerprinting" has not yet been successfully done in Alaska and is critical to the development of reliable avalanche detection and warning system(s).

#### **Problem Objectives**

The goal of this project is to identify

- unique or characteristic seismic and/or acoustic signatures of avalanches including pre-release symptoms as well as signatures of avalanches in motion,
- reliability of avalanche detection using seismic and acoustic sensors, and feasibility of development of warning and/or road closure systems.

#### **Project Status**

In 2003, researchers installed sensors and communication equipment have been installed in avalanche running zones near Girdwood, Alaska. Due to sensor and communication failures during the 2003-2004 winter season, no data is available to date.





# MAINTENANCE & OPERATIONS

## Evaluation of DGPS Guidance for Snowplows

**Project Number:** T2-03-06

**Estimated Completion Date:** Closed

**Estimated Cost:** \$100,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Jeff Ottesen, Statewide Planning/ITS

### **Problem Statement**

Snowplow guidance systems using Differentially-corrected Global Positioning System (DGPS) coupled with in-vehicle heads-up navigation system have been successfully developed by University of Minnesota Intelligent Transportation Systems (ITS) Research laboratory. It is not known if such systems can cost effectively work in mountainous terrain which is unlike the rolling farmland of Minnesota.

### **Problem Objectives**

The objective of this research is to demonstrate the feasibility of DGPS guidance systems for snowplows in mountainous Alaskan terrain.

### **Project Status**

Project reprogrammed under AKDOT&PF's Intelligent Transportation Systems Program.

### **Available Reports**

- N/A





## MAINTENANCE & OPERATIONS

### Mitigation of Drifting Snow at Trans Alaska Pipeline Crossings

**Project Number:** T2-03-07

**Estimated Completion Date:** 6/30/06

**Estimated Cost:** \$15,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Dwight Stuller, AKDOT&PF Northern Region M&O
- Stephen Sorensen, P.E. Alyeska Pipeline Service Company
- Coleen Ackiss, P.E., AKDOT&PF Northern Region Traffic & Safety

**Project Status**

AKDOT&PF research and traffic engineers have identified geometric and safety deficiencies with these guardrails and have had preliminary discussions on potential mitigation options with Alyeska Pipeline Service Company. Researchers will prepare a report that identifies all of the maintenance and safety issues and makes recommendations for mitigation as appropriate.

**Available Reports**

- Interim: n/a
- Final at project end



**Problem Statement**

Where the trans-Alaska crude oil pipeline crosses the Dalton Highway on Alaska's windy Arctic tundra, there are sections of high guardrail designed to protect the pipeline from errant industrial truck traffic. These guardrails are perfect windbreaks that cause the chronic formation of traffic-blocking snowdrifts in the highway. Removal of these drifts is a constant and expensive maintenance task because the relentless arctic wind forms new snowdrifts within hours after plowing.

**Problem Objectives**

The purpose of this project is to identify cost-effective drift mitigation options and/or safety treatments for these problem areas.



## MAINTENANCE & OPERATIONS

### Evaluation of Solid Oxide Fuel Cells at Alaskan RWIS Sites

**Project Number:** T2-03-08

**Estimated Completion Date:** Closed

**Estimated Cost:** N/A

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Jeff Ottesen, AKDOT&PF Statewide Program Development

#### **Problem Statement**

Producing power at remote sites for Road Weather Information Systems (RWIS) and other applications is a vexing problem. Solar radiation is limited in Alaska's northern latitudes. Extending power lines can be prohibitively expensive, and on-site engine-generators are both expensive and can be maintenance intensive. Fuel cells using solid oxide technology offer advantages of simplicity, fuel efficiency, fuel simplicity and potentially lower capital costs, once they enter mainstream production.

#### **Problem Objectives**

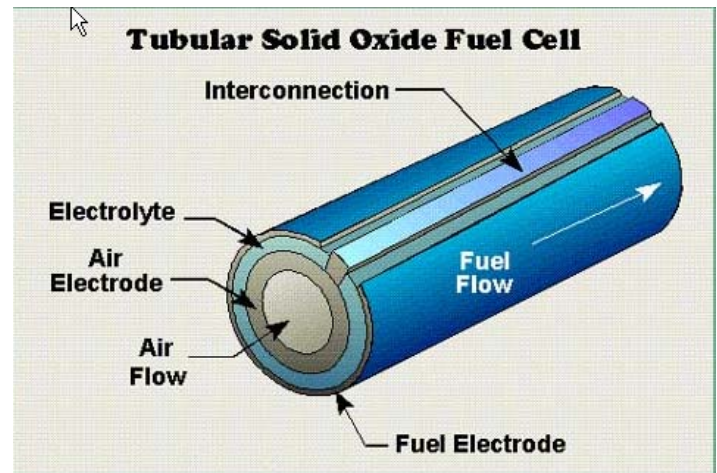
The objective of this project was to demonstrate the feasibility of using solid oxide fuel cells in a remote Alaskan settings and to identify any impediments to future implementation.

#### **Project Status**

Researchers investigated the option of installing, and monitoring a small solid oxide fuel cell and determined that the technology is immature for cost-effective, remote installations. Estimated costs of a single fuel cell, engineering, and installation exceeded \$200,000.

#### **Available Reports**

None





# MARINE HIGHWAYS

## Floating Donut Rubber Fender Testing

**Project Number:** T2-03-09

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$50,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Kirk Miller, ADOT&PF Marine Design Engineer

### **Problem Statement**

ADOT&PF intends to use an existing floating rubber fender in a unique manner to accommodate Alaska's Fast Ferries. In order to do this, several parameters must be established including inner pipe thicknesses, sleeve materials, and stiffness. If DOT&PF develops a set of specifications without the benefit of testing, it runs the risk of premature failure as a result of improper specification parameters. Our designers are unclear about what to specify. Testing will provide us with the necessary data to properly design fenders. Alaska Marine Highway System (AMHS) vessels are unique. It is doubtful a fender manufacturer will conduct independent testing for our particular application since the number of fenders sold would not be financially attractive.

### **Research Objectives**

This study will fabricate and lab-test AMHS vessel specific floating rubber fenders to be used in the new fast ferry terminal improvements. Load and deformation data will be obtained to understand the long-term load capacity and durability of these all-tide moorage fenders. Lab tests will determine allowable loads and related energy absorption when these fenders are berthed against the vessel's sponson. The purpose is to establish design and

performance criteria that can be applied to the specific needs of the AMHS ferry vessels and allow DOT&PF designers to tailor the product to the intended application.

### **Project Status**

All testing and data analysis complete. Expecting final report from Marine Highways.

### **Available Reports**

- Final at project end





## MATERIALS & CONSTRUCTION

### High Temperatures of Alaskan Pavements

**Project Number:** T2-99-07

**Estimated Completion Date:** 9/30/05

**Estimated cost:** \$10,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Steve Saboundjian
- Billy Connor

#### **Problem Statement**

Under a previous research study, DOT&PF developed a database of air temperatures around the state to investigate low temperature effects on polymer AC pavements. High temperature data still needs to be processed to develop mathematical relationships between air and pavement surface temperatures. The Superpave design system, developed as part of the SHRP asphalt research program, requires that these high-end temperatures be known to satisfy given performance requirements. Processing of the existing high temperature data will allow the design engineer to confidently specify the correct Superpave asphalt binder, which will lead to improved pavement performance and reduced maintenance costs.

#### **Research Objectives**

Develop design pavement surface temperatures on the high end to satisfy the Superpave design method requirements for developing accurate asphalt binder specifications.

Process existing computer database files for high temperatures, plotting air and pavement temperatures for approximately 20 sites around the state.

Use the mathematical relationships between air and pavement surface temperatures to derive

the design pavement temperatures.

#### **Project Status**

Summer air and pavement surface temperature data for past years are being analyzed to develop air/pavement high temperature correlations for about 20 sites around the state. These will be compared to the Superpave average 7-day pavement high temperature to decide if they are appropriate for Alaskan conditions.

#### **Available Reports**

- Interim: n/a
- Final at project end







# MATERIALS & CONSTRUCTION

## Implementation of Asphalt Mix Designs

**Project Number:** T2-03-13

**Estimated Completion Date:** 9/30/05

**Estimated cost:** \$20,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Billy Connor

### **Problem Statement**

The department currently makes high-cost asphalt-paving decisions based on short-term contractor risk analysis during the project bidding phase. These decisions often result in less than optimum asphalt performance, and in occasional pavement failures. There is a need to compile a library of past asphalt mix designs, and if possible, correlate them to pavement performance attributes. The successful mix designs for a given route or locale could then be used to define future project specifications. Correlating mix designs with performance would allow the pavement engineers to implement the most cost-effective asphalt aggregate gradations.

### **Research Objectives**

Determine and recommend which pavement aggregate gradations will result in the most successful pavement for each locality.

Implement the most cost-effective asphalt aggregate gradations.

End up with higher quality pavement, a more uniform bidding platform, and lower maintenance costs.

After obtaining historical asphalt mix designs, four candidate aggregate gradations were identified. Materials lab completed mix designs and obtained pertinent mix data. Results will be included in a final report.

### **Available Reports**

- Interim: n/a
- Final at project end

## **Project Status**



# MATERIALS & CONSTRUCTION

## Use of Modified Asphalts

**Project Number:** T2-02-18

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$40,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Steve Saboundjian
- Billy Connor

### **Problem Statement**

Fatigue transfer functions for conventional asphalt concrete mixes have been developed and are being used in flexible pavement design both in Alaska and elsewhere. However no such functions exist for polymer modified asphalt (PMA) mixes. It is well known that PMA mixes enhance fatigue performance, however this enhancement needs to be quantified. This project will collect from the three regions of the state typical aggregates and binders (conventional and PMA) and evaluate their fatigue resistance using laboratory flexural fatigue beam tests. Fatigue equations will be developed for all mixes.

### **Research Objectives**

The goal of this project is to develop fatigue transfer functions for Alaskan conventional and PMA mixes in order to use them in flexible pavement design.

### **Project Status**

The Transportation Research Center at UAF is carrying out the project. After producing lab-compacted specimens for testing, fatigue testing was performed at different temperatures. Modeling and analysis are underway.

### **Available Reports**

- Interim: literature review and mix design information
- Final at project end





# MATERIALS & CONSTRUCTION

## Development and Validation of Urban Rutting Models

**Project Number:** T2-01-20

**Estimated Completion Date:** 6/30/05

**Estimated Cost:** \$50,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Scott Gartin
- Newt Bingham

### **Problem Statement**

Rutting of asphalt pavements is a primary mode of distress for our urban roadways. The combined effect of permanent deformation and studded-tire wear creates hazardous driving conditions. In the past, the DOT&PF collected rut depth measurements on high-speed, high-volume roads (e.g. Seward and Glenn Hwys.) and developed models and curves to relate rut depth to number of vehicle passes (i.e. studded tire applications). This was done for SMA (stone mastic asphalt) and Type 2 mixes in the Anchorage area.

### **Research Objectives**

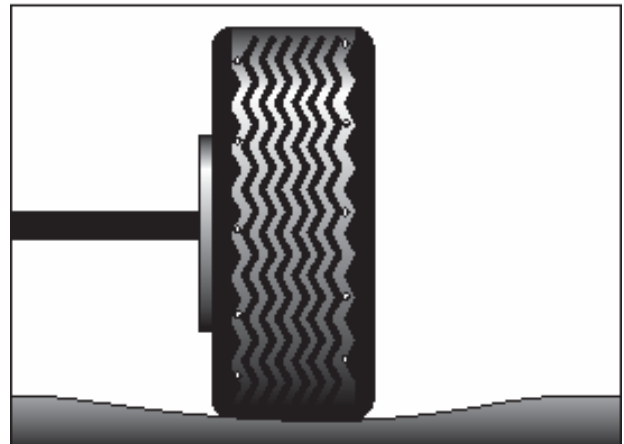
In this study, it is proposed to develop models and curves to relate rut depth versus studded tire applications for different mix types for urban roads (especially in Anchorage and Juneau) where vehicle speed is lower and driving habits are different (e.g. frequent change of lane). The model and curves to be developed in this study would help predict the number of vehicle passes to reach the maximum acceptable amount of rutting and consequently pavement life. This will enable us to adequately program pavement rehabilitation and to determine which sections should be candidates for rehabilitation and when.

### **Project Status**

Draft final report is being reviewed.

### **Available Reports**

- Interim: n/a
- Final at project end





# MATERIALS & CONSTRUCTION

## High-Float Surfacing for Gravel Roads

**Project Number:** T2-01-21

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$50,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Steve Saboundjian
- Billy Connor
- Frank Ganley

### **Problem Statement**

High-float (HF) surfacing is increasingly being used to surface gravel roads in Alaska. Various material sources and gradations have been used to construct HF jobs with varying success. Specifications have been modified to produce a more durable product. However, many questions remain unanswered. These pertain to:

- Aggregate gradation, maximum size, amount of fines, moisture content, rate of application, compatibility with the high float used.
- HF emulsion specifications: minimum and/or maximum limit values
- Ambient and base temperatures and the cut-off date for paving in different regions of the state.
- Optimal distances between HF distributor, aggregate spreader and compaction equipment.
- Traffic control and speed after application of the surface treatment.
- Aggregate sweeping intensity and frequency.

### **Research Objectives**

This project aims at collecting information related to the variables enumerated above from past, present and near-future projects. This information will be used to determine the optimal materials and construction conditions for a successful and durable high-float surface treatment.

### **Project Status**

Construction project records are being reviewed and analyzed to come up with a design method for known aggregate gradation, voids and density properties. Field samples were tested in the lab to determine asphalt content and aggregate gradation.

### **Available Reports**

- Interim: n/a
- Final at project end





# **MATERIALS & CONSTRUCTION**

## **Evaluation of Alternate Embankment Construction Methods**

**Project Number:** T2-03-11

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$25,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Billy Connor

### **Problem Statement**

In a number of Bush communities and remote locations of Alaska, the construction season is short and fill material is hard to come by. The cost of fill material is so high that only a few projects can be accomplished within budget every year. In addition, claims associated with pit failure are numerous. An alternative material method of constructing airport and roadway fill needs to be determined.

### **Research Objectives**

The objective of this study is to evaluate the available embankment construction materials/methods. Candidate materials include lightweight aggregates, insulation, EPS foam (extruded polystyrene systems)

### **Project Status**

A literature review was carried out and information summarized in draft report; the report is being reviewed for final publication.

### **Available Reports**

- Interim: n/a
- Final at project end





# MATERIALS & CONSTRUCTION

## Development of Pavement Design Manual

**Project Number:** T2-02-14

**Estimated Completion Date:** Software and manual complete. Project extended to add Life Cycle Costing

**Estimated Cost:** \$110,000

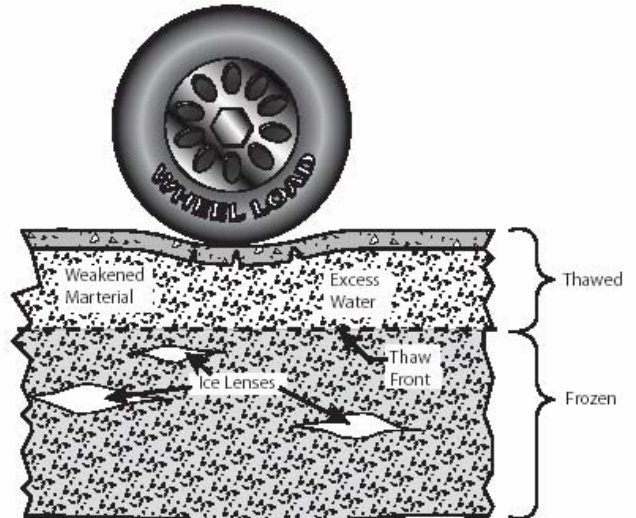
**Project Manager:** Billy Connor

Pavement design procedures continue to evolve, consequently this project was established to revise the pavement design software and for the first time prepare a pavement design manual.

Both the manual and software work in concert incorporating two design procedures:

- Mechanistic
- Excess fines methods.

Both include new and overlay design. The manual provides the designer with assistance with materials properties.



### Available Reports:

- Alaska Flexible Pavement Software
- Alaska Flexible Pavement Design Manual FHWA-AK-RD-03-01

AKFOSSE

Project Information

Project Name: State's Project Designer: R.L.M.

Project No.: AK 98087099900 Date: 11/25/02 05:04 AM

Asphalt Information

Maximum Specific Gravity (P<sub>max</sub>): 2.516 Asphalt: 5.5 Compaction: 95 System of Measures: Metric

Load Information

Configuration: Dual Tire CHANGE LOADS Tire Pressure (psi): 90

Traffic Information

ADT: 5000 ☒ Spring ☒ Summer ☒ Fall ☒ Winter

Historical Loads: 150000 20 40 10 20

Future Loads: 1000000 25 45 15 15

Layer Information

Material Type	Thickness (in)	Spring		Summer		Fall		Winter	
		Modulus (ksi)	Poisson Ratio	Modulus (ksi)	Poisson Ratio	Modulus (ksi)	Poisson Ratio	Modulus (ksi)	Poisson Ratio
Asphalt	2	750	.3	500	.3	500	.3	1500	.3
Base Course	5	40	.35	51	.35	51	.35	100	.35
Base Sub	36	26	.4	26	.4	26	.4	50	.35
Subgrade	5.0E+4	40	.35	10	.45	10	.45	10	.45

LOAD FILE SAVE FILE ANALYZE EXIT



# MATERIALS & CONSTRUCTION

## Training for Contracting Officers Warrant System

**Project Number:** T2-03-16

**Estimated Completion Date:** ongoing

**Estimated Cost:** \$52,500

**Project Manager:** Simon Howell

### **Warrant System Background**

The Warrant System is for use in activities leading to the development and execution of construction projects. Under the Warrant System, tiered levels of authority and responsibility identify experience and training requirements as is required for certification at each of the six (6) levels.

### **Training needs**

The AKDOT&PF warrant system training will be incorporated into T2's training calendar for the next two calendar years in the following format:

#### **Level I**

Alaska Procurement Rules & Regulations: Training will address Alaska procurement rules and regulations, departmental policies and procedures, code of ethics, mandatory and nonmandatory procurement restrictions, exemptions and transfer of responsibility, basic purchasing and solicitation, Alaska preference, professional versus nonprofessional services, solicitations, evaluations of response, documentation, and protest procedures.

#### **Level II**

Contract administration: Training will address administering contracts under the Alaska procurement rules and regulations, departmental policies and procedures, to enforce performance, quality, warranty as well as other contract terms.

#### **Level III**

Negotiation: Training will emphasize

communications skills necessary for successful contract negotiations

#### **Level IV**

Contract Law I: A comprehensive training course that covers a range of legal issues that frequently arise in State of Alaska contracting.

#### **Level V**

Innovative Procurement: Training will provide an industry overview of negotiated type contracts such as Design/Build, Best Value, Single Source, and Professional Services Agreements.

#### **Level VI**

Contract Law II: Training will address the general principles of state contract law, describing the statutory and administrative control of funds, explain socioeconomic policies associated with small businesses and labor standards (i.e. Davis Bacon, DBE, ADA), discuss contract formation issues and bid process, and describe legal considerations associated with post award contract administration claims, and terminations.

**Status:** 80% complete



# MATERIALS & CONSTRUCTION

## Theoretical Density Determination with Nuclear Gauge

**Project Number:** T2-03-12

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$15,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Steve Saboundjian
- Zeke Yankee

### **Problem Statement**

The Proctor and Vibratory standard methods for determining the degree of field compaction for soils and aggregates require obtaining a field sample (by digging the compacted layer) for screening/sieving. This is done to correct the values obtained from these tests.

Field materials technicians in the Southeast Region observed that a simple calculation could replace this time-consuming procedure. The same was observed for asphalt mixes. It is speculated that by knowing the coarse aggregate specific gravity, the percent voids and air void ratio (through nuclear densometer), one can calculate the maximum density of the material, and subsequently its percent compaction.

### **Research Objectives**

The objective of this study is to check the validity, applicability and limits of the simple method described above. This will be achieved by compiling and organizing the data collected by the Southeast technicians for soils, aggregates and asphalt mixes; applying the simple calculation method to obtain maximum density values; then comparing these values to those obtained by using the standard tests. Values from projects in other regions could also be analyzed to check the universality of the

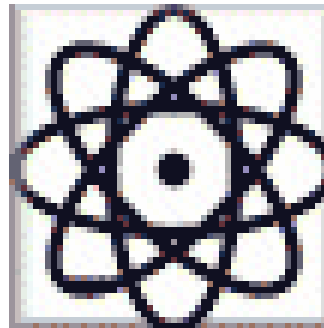
suggested method.

### **Project Status**

Compilation and data analysis is complete; draft final report is being written.

### **Available Reports**

- Interim: n/a
- Final at project end





## MATERIALS & CONSTRUCTION

### Evaluation of LiDAR as a Data Acquisition Technique in Alaska (Research Response Program)

**Federal Project Number:** T2-02-16

**Estimated Completion Date:** September 2005

**Estimated Cost:** \$20,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:** Scott Sexton, Northern Region Right-of-Way

**Principal Investigator:** Clint Adler

#### **Problem Statement**

LiDAR (Light Direction and Ranging) is a relatively new airborne survey technique. It may be of great benefit to the Alaska Department of Transportation and Public Facilities in collecting terrain data for use in road design. It's not known how well a LiDAR will perform in obtaining ground terrain data in Alaska due to the following factors:

- Errors propagated by the Global Positioning System (GPS) at this latitude
- Effect of ground cover – i.e. trees, brush, grass.
- Variations in the gravitational field which have not been well researched in Alaska
- Computer algorithms of the LiDAR system.

Besides potential systematic errors, an evaluation must be made of the practical aspects of processing the huge amounts of data generated, the amount of on the ground field checking required, and the specifics of how the data should be delivered to reduce error in the data. If the parameters of LiDAR data acquisition can be determined, potentially large cost savings and time savings could result, especially in the design of long rural projects.

#### **Research Objectives**

This study is expected to resolve the following questions on LiDAR:

- The horizontal and vertical accuracy of the LiDAR system in typical applications.
- The ability of LiDAR to model terrain which is steep or forested.
- The reliability of computer algorithms used in data processing.
- The ability of the data processing software to output data in more dense or less dense patterns depending on the users preference for detail in certain areas.
- How well AKDOT/PF computers can process the finished DTM - files can be quite large.
- As the LiDAR system does not collect breaklines, how well these breaklines can be inferred by the computer algorithm, the data density or with the aid of aerial photos.
- The effect of latitude on the GPS readings.
- What post flight checks of the system should be required to be performed before the airplane leaves the area.
- The ability of the system to adjust the final DTM given additional independent ground survey data.
- The cost effectiveness of LiDAR vs. traditional DTMs.

#### **Project Status**

Several Aerial LiDAR surveys were flown on three small Interior Alaskan projects during the Summer of 2002. Data analysis is underway.

#### **Available Reports**

Interim: Interim report available from project manager.

Final at project end



# MATERIALS & CONSTRUCTION

## Aggregate Abrasion Using the Nordic Ball Mill Test

**Project Number:** T2-04-01

**Estimated Completion Date:** 12/31/05

**Estimated Cost:** \$30,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Materials sections of the three Regions
- Billy Connor

### **Project Status**

A market search is currently carried out to acquire a Nordic Ball tester for the NR Materials lab. A work plan will be written to carry out the project.

### **Available reports**

At project end

### **Problem statement**

Aggregate durability, hardness and abrasion resistance can be measured using tests such as the Degradation Value test (Deg), the Los Angeles test (LA) and the Nordic Ball Mill test (NB). However the repeatability and reproducibility of the Deg test have been questionable. In addition, when compared to the NB test, the Deg and LA tests do not seem to distinguish among varying levels of aggregate wear susceptibility. Therefore there was a need to study the NB test results in comparison to the conventional Deg and LA results, and to assess its repeatability and reproducibility.

### **Objectives**

The objective are to test aggregates from different projects, from the three regions of the state using the Nordic Ball Mill test, then compare results to the conventional test results (i.e. Deg and LA). Repeatability and reproducibility of the Nordic test will be assessed. Maximum Nordic abrasion specification values will be established for the different aggregate materials depending on their location in a pavement structure (wearing, binder or base course), and the traffic level (AADT).





## MATERIALS & CONSTRUCTION

### Use of Rubber in Hot Mix Asphalt to Reduce Rutting

**Project Number:** T2-04-02

**Estimated Completion Date:** 6/30/05

**Estimated cost:** \$50,000

**Project Manager:** Steve Saboundjian

**Technical Advisory Committee:**

- Newt Bingham
- Bruce Brunette
- Billy Connor

- Capture the knowledge of others that use asphalt rubber mixes successfully; a thorough review of existing specifications will be performed.

#### **Project Status**

Laboratory mix designs were performed to study the effects of varying rubber and asphalt contents on mix properties.

#### **Available Reports**

At project end

#### **Problem Statement**

A review of pavement performance indicates that the life of Alaskan pavements is typically less than 6 years. Northern European and Alaskan research indicates that the use of "hard" aggregates in an HMA (low Nordic Abrasion values) improves the studded tire wear resistance of the pavement. Initial results of recent Alaskan research using the Swedish Prall test device shows promise that the use of crumb rubber modifier (CRM) in the HMA may also lead to improved surface wear resistance of the pavement. In this case, a granulated CRM was added to the aggregate.

#### **Research Objectives**

The objective of this research project is to further evaluate the use of asphalt rubber in Alaskan asphalt mixes for high volume roads. In particular:

- Refine and optimize the design of asphalt concrete made with rubberized asphalt cement and crumb rubber added as substitute aggregate.



## PLANNING & ADMINISTRATION

### Enhancing Estimating Procedures

**Project Number:** T2-01-13

**Estimated Cost:** \$40,000

**Est. Completion Date:** 7/1/05

**Project Manager:** Billy Connor

**Technical Advisory Committee:** N/A

#### **Problem Statement**

DOT&PF has collected data from bid packages for many years. While each region has written software to use the data, none of the regions believe the data is used to its full potential. A review of department needs indicated a two-fold problem: there are no standards to assure the estimates required for each project phase (planning, preconstruction, and construction) are accurate, and various methodologies are used.

By centralizing the data and analysis, the data could be used to better prepare an engineer's estimate and to assist Construction in estimating the cost of change orders.

#### **Research Objectives**

Centralize the historical data collection and analysis from completed bid packages.

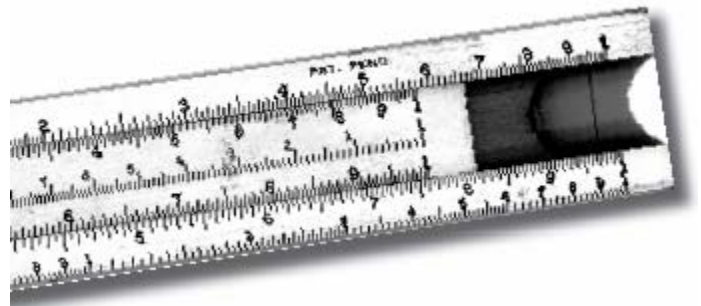
Develop a common software to standardize engineers' estimate preparation during the design phase and when estimating change order costs during the construction phase.

#### **Project Status**

We executed a contract with Elieff and Associates to rewrite the current BidTabs program. The software will be available by the end of June 2005. Elieff and Associates will be retained for product support through the end of September, 2005.

#### **Available Reports**

- Interim n/a
- Final anticipated at the end of the project; expect a software product.





## TRAFFIC & SAFETY

### Evaluation of Lighted Crosswalks

**Project Number:** T2-03-15

**Estimated Completion Date:** 9/30/05

**Estimated Cost:** \$30,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Kurt Smith, Statewide Traffic Engineer
- Jill Sullivan, Statewide Intelligent Transportation Systems Coordinator

#### **Problem Statement**

Available evidence shows that in-road crosswalk warning lights increase pedestrian safety at uncontrolled pedestrian crossings, however they are susceptible to snow plow damage and winter maintenance and operations. Above-ground, pedestrian activated yellow crosswalk lighting systems promise increased pedestrian safety and decreased maintenance at uncontrolled crosswalks in Alaska. However, AKDOT&PF lacks conclusive data on the effectiveness and economics of such treatments.

#### **Research Objectives**

The purpose of this project is to determine whether above-ground warning systems are as effective as in-road lights at uncontrolled pedestrian crossings in increasing pedestrian safety at uncontrolled crosswalks. Researchers intend to evaluate the effectiveness of above-ground, pedestrian activated yellow crosswalk treatment systems in terms of improved driver awareness and system operational costs. AKDOT&PF intends to identify the system(s) for Alaska that maximize pedestrian safety and minimizes maintenance costs. Ultimately, the research will support the development of engineering criteria and warrants for including such systems into projects.

#### **Project Status**

University of Alaska Fairbanks researchers are beginning a literature search.

#### **Available Reports**

- Interim: NA
- Final at end of project.





## TRAFFIC & SAFETY

### Evaluation of Effectiveness of Rumble Strips in Alaska

**Project Number:** T2-01-26

**Estimated Completion Date:** Completed

**Estimated Cost:** \$30,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Kurt Smith, Statewide Traffic Engineer
- Scott Thomas, Southcentral Region Traffic Engineer

#### **Problem Statement**

AKDOT&PF lacked quantitative information on effective designs/configurations for rumble strips in Alaska. While available information suggests that rumble strips significantly reduce run-off-the-road accidents and enhance lane delineation, national and state standards for rumble strip application and configuration either do not exist or do not address safety and environmental issues comprehensively. ADOT&PF designers must often gather this information from widely dispersed sources that are generally lacking in application criteria and information on potential adverse effects in Alaskan conditions.

#### **Research Objectives**

The objectives of this study are to generally document ongoing national research and Alaska's experience with rumble strips. Alaska has installed several rumble strip configurations including milled, rolled, shoulder, centerline, continuous, and discontinuous rumble strips with various widths and spacing. The study aims to characterize Alaska's experiences with these rumble strips in terms of four main topics:

*Effectiveness* - This includes the amount of vibration and noise and the ability to perform well in adverse weather conditions.

*Adverse Effects on the traveling public* - This includes impacts to motorists and bicyclists.

*Adverse Effects on the AKDOT&PF* - This includes potential impacts to maintenance operations.

*Adverse Effects on the Environment* - This includes undesirable generation of noise and solid waste.

Findings of this research may be used to refine design and installation policy for the AKDOT&PF and will identify future research needs.

#### **Project Status**

Final report in press. AKDOT & PF Research staff have been gathering data and conducting field observations since the first half of 2001 and presented preliminary findings to AKDOT&PF traffic engineers. Based on this and the research of other states, AKDOT&PF issued rumble strip policy in May 2001.

#### **Available Reports**

- Interim report available from project manager.
- Final report should be available during the second quarter 2005.







## TRAFFIC & SAFETY

### Evaluation of Detectable Warnings in Alaska (Research Response Program)

**Project Number:** T2-02-22

**Estimated Completion Date:** 6/05

**Estimated Cost:** \$20,000

**Project Manager:** Clint Adler

**Technical Advisory Committee:**

- Kurt Smith, State Traffic Engineer

#### **Problem Statement**

AKDOT&PF does not have quantitative information on the performance of detectable warnings in cold weather climates .

Visually challenged pedestrians require cues to differentiate between pedestrian ways and vehicle pathways. The Americans with Disabilities Act Accessible Guideline (ADAAG) has required installation of detectable warnings in these areas since July 26, 2001.

#### **Research Objectives**

The objective for this project is to evaluate performance of various detectable warning systems in cold climatic conditions. The goal of this project is to recommend product configurations and suitable performance standards for detectable warning systems in Alaska.

#### **Project Status**

Researchers have monitored various Alaska installations since Fall of 2002 to summer 2004 to evaluate performance of detectable warnings subjected to extreme winter conditions.

#### **Available Reports**

- Interim: Unpublished Interim Report  
Available from project manager

- Final at project end







## POOLED FUND STUDIES

### Pooled Fund Studies Program

**Coordinator:** Clint Adler

#### **Program Description**

The department may participate in pooled fund studies, in which resources from several states or other government agencies, universities, and/or industry sources are combined to support a single research effort. Contributions to such cooperative studies, if they have been approved by the FHWA as part of their national or regional Pooled Fund Study Program, are 100% federally funded. As such, they do not require the 20% in state matching funds common to other SPR-funded research activities. Proposals for participation in Pooled Fund Studies must come to DOT&PF's research advisory board for approval. The research manager coordinates nominations for Pooled Fund Studies.

Problem Statements are at:

<http://www.pooledfund.org/>.





## POOLED FUND STUDIES

### Aurora Program

**Project Number:** FHWA Proj. No. SPR-3(042)

<http://www.aurora-program.org/for-project-updates>.

**Lead Agency:** Iowa Department of Transportation

**Established:** 1996

**Estimated Completion Date:** Ongoing project.

**AKDOT&PF Contribution:** Funding from AKDOT&PF Intelligent Transportation System Program.

**AKDOT&PF Technical Contact:** Jack Stickel, Terry Onslow

### **Research Objectives**

Aurora is an international program collaborative research, development and deployment in the field of road and weather information systems (RWIS), serving the interest and needs of public agencies. The Aurora vision is to deploy RWIS to integrate state-of-the-art road and weather forecasting technologies with coordinated, multi-agency weather monitoring infrastructures. It is hoped this will facilitate advanced road conditions and weather monitoring and forecasting capabilities for efficient highway maintenance, and provision of real-time information to travelers.

### **Status**

Study is ongoing and will continue for the foreseeable future. Members contribute funds annually; propose research projects on RWIS-related projects (Road Weather Information Systems); manage contracts for the research; and prepare reports/submit results for publication. One of Aurora's goals is to provide guidelines for RWIS implementation and usage. Refer to



## POOLED FUND STUDIES

### **Strength and Deformation Analysis of MSE Walls at Working Loads**

**Project Number:** FHWA Proj. No. SPR-3(072)

**Lead Agency:** Washington State Department of Transportation

**Established:** 2000

**Estimated Completion Date:** 12/31/04.

**AKDOT&PF Contribution:** \$20,000

**AKDOT&PF Technical Contact:** Keith Korri,  
State Foundation Engineer

#### **Research Objectives**

The high cost of overly conservative designs can be avoided. It is anticipated that the amount of soil reinforcement needed for geosynthetic MSE walls can be reduced by a factor of two or more, and it may be possible to reduce reinforcement needs for steel MSE walls as well through better definition of the true factor of safety for internal stability.

#### **Status**

Research team is actively building and testing the walls with good backfill. Work on walls with marginal soil backfill will begin in the spring of 2004. Additional funds are currently being solicited to complete the work on walls with marginal soils.



## POOLED FUND STUDIES

### **Wiremesh and Cablemesh Slope Protection**

**Project Number:** FHWA Proj. No. SPR-3(077)

**Lead Agency:** Washington State  
Department of Transportation

**Established:** March, 2000

**Estimated Completion Date:** 12/31/2004.

**AKDOT&PF Contribution:** \$10,000

**AKDOT&PF Technical Contact:** Dave Stanley

#### **Research Objectives**

Draped wiremesh and cablemesh slope protection has been utilized by states for many years to control rockfall. The initial design and specifications for these draped wiremesh slope protection systems were developed using empirical methods by WSDOT in the late 1950's for slopes that were generally less than 75 feet in height. Over the years the draped wiremesh slope protection designs have been modified by other states so that nationwide we now have a large number of design variations, none of which have been quantified..

#### **Status**

The project is nearing completion and the final report will be produced by the end of 2004. (updated: 7/28/04).



## POOLED FUND STUDIES

### Development of the Advanced Rotary Plow (ARP) for Snow Removal Operations

**Project Number:** FHWA Proj. No. SPR-3(091)

**Lead Agency:** California Department of Transportation

**Established:** 2000

**Estimated Completion Date:** Completed.

**AKDOT&PF Contribution:** \$10,000

**AKDOT&PF Technical Contact:** Frank Richards, AKDOT&PF Statewide Maintenance Engineer

#### **Research Objectives**

Present operations to remove snow around barrier devices, such as guardrails, have the rotary snowplow in contact with the barrier device. This causes damage to the plow and to the infrastructure. There are also safety issues involved if the driver misses or contacts the end of the barrier device. This project develops an automated guidance system for rotary plows along barrier devices to insure that the plow does not contact the barrier device while removing snow as close as possible to the barrier device. (updated 7/7/01)

#### **Status**

The equipment was tested during the 2002/2003 winter. Final report pending.





## POOLED FUND STUDIES

### Pavement Marking Life Cycle

**Project Number:** FHWA Proj. No. SPR-3(094)

**Lead State:** Utah Department of Transportation

**Estimated Completion Date:** 12/31/05

**AKDOT&PF Contribution:** \$20,000

**Project Technical Contact:**

- Clint Adler

#### **Problem Statement**

Utah Department of Transportation (UDOT) is managing this pooled fund research study that is leveraging resources from nine state departments of transportation and the Federal Highway Administration. UDOT hired B.C. Traffic Inc. of Woodbury Minnesota to (1) collect, compile and analyze pavement marking retroreflectivity data, and (2) use that data to develop service life performance curves of retroreflectivity vs. time for selected durable pavement marking materials.



#### **Research Objectives**

The objective of this study is to develop service life performance curves of retroreflectivity vs. time for selected durable pavement marking materials based upon data collected periodically on various highways in nine states.

#### **Project Status**

In the Summer of 2002, the contractor began data collection with a LaserLux van in each of the participating states except Alaska. Technical problems delayed delivery of Alaska's LaserLux van to until the summer of 2003. Since then, AKDOT&PF has been collecting retroreflectivity data in the Anchorage area. Data collection will be complete by September, 2005.

#### **Available Reports**

- Interim: n/a
- Final at project end



## POOLED FUND STUDIES

### Fish Passage Capability through Modified Culverts: Flume Research Study

**Project Number:** FHWA Proj. No. SPR-3(096)

**Lead State:** Washington State Department of Transportation

**Estimated Completion Date:** 12/30/06

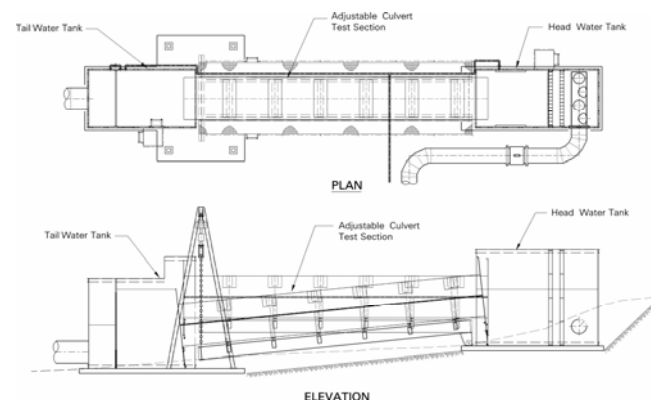
**AKDOT&PF Contribution:** \$120,000

**AKDOT&PF Technical Contact:** Mark Miles & Clint Adler

**AK Department of Natural Resources, Office of Habitat Management & Permitting**  
**Technical Contact:** Mac McLean

#### Problem Statement

Hydraulic Engineers use swimming capability criteria developed specifically for arctic grayling to determine stream discharges for use in designing culverts for fish passage. While this application is certainly appropriate where Arctic grayling exist, blind application of designs developed for grayling results in potentially inappropriate designs for other species. Juvenile salmon are a species of great concern – especially throughout the Pacific Northwest. Unfortunately, quantitative swimming capability information that engineers can use to design culverts is not available for young salmon and steelhead trout.



#### Research Objectives

We know that young salmonids use the boundary layer along the culvert walls to pass through culverts, however, flow velocity data near the culvert walls at various barrel slopes and flows is lacking. Also, the complex hydraulics at culvert inlets and outlets present potential barriers to fish passage. This researchers will:

- Increase quantitative information on how water velocities in culverts affect fish passage (especially juvenile salmon).
- Develop better engineering criteria for passing juvenile salmonids and other species through culverts.
- Provide information necessary to optimize economic culvert designs for fish passage.

#### Project Status

The study has funded the construction of a culvert flume adjacent to the Skookumchuck fish hatchery near Tenino, WA. The flume is capable of testing 40 foot long culverts up to 6 feet in diameter. The research contractor (Battelle's Pacific Northwest Laboratory) has performed a suite of hydraulic and fish passage tests and released a preliminary report.

#### Available Reports

- Interim: PNNL Report #14349, "Evaluation of Juvenile Fish Passage through an Experimental Culvert Test Bed: Standard Protocols and Baseline Characterization"
- Final at project end



## POOLED FUND STUDIES

### Animal-Vehicle Crash Mitigation Using Advanced Technologies

**Project Number:** FHWA Proj. No. SPR-3(076) and TPF-5(082)

**Lead State:** Oregon Department of Transportation

**Established:** 4/30/99

**Estimated Completion Date:** 9/30/05

**AKDOT&PF Contribution:** \$50,000

**AKDOT&PF Technical Contact:** Clint Adler & Scott Thomas

#### **Problem Statement**

According to 1994 AKDOT&PF Research, about 500 moose-vehicle collisions (MVCs) occur on Alaskan roadways annually, amounting to >20% of all motor vehicle accidents that occur on rural roads. Drivers may become desensitized to static moose crossing signs. Few quantified studies exist on the effectiveness of technologies to detect roadside animals that then warn drivers dynamically of wildlife near the road.

#### **Research Objectives**

This project demonstrates and evaluates the effectiveness, costs, and benefits of some advanced technologies for warning drivers of the presence of animals near roadways.

A final report and personal presentation summarizing system costs, measured benefits, issues and limitations will be given to contributing agencies. This information can be used by Alaska DOT&PF to determine appropriate application of this technology.

#### **Status**

Vendors installed experimental radio detection system in Montana in the Fall of 2002. The Western Transportation Institute is under contract to monitor and evaluate the system.

Preliminary results indicate that the very expensive Montana system is functioning but has required several field modifications.

#### **Available Reports**

- Interim unpublished report available.
- Final at project end





## POOLED FUND STUDIES

### **Pavement Subgrade Performance Study**

**Project Number:** FHWA Proj. No. SPR-2 (208)

**Lead State:** New York; work conducted at CRREL, New Hampshire

**Established:** 02/01

**Estimated Completion Date:** 12/05

**AKDOT&PF Contribution:** \$10,000

**AKDOT&PF Technical Contact:** Steve Saboundjian

#### **Research Objectives**

The objectives of the study are to develop an improved mechanistic subgrade failure criterion for pavements and to evaluate the effect of environment (seasonal variability) on resilient material properties

#### **Status**

Ongoing. Eleven of the 12 pavement test sections, using different subgrades at varying moisture contents, have been constructed as of February 2005. Accelerated testing of the 12th section is scheduled for the spring of 2005 and construction of the final test sections is scheduled for shortly thereafter.

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### **Effects of Multiple Freeze-Thaw Cycles vs Deep Frost Penetration on Pavement Performance**

**Project Number:** Pooled Fund Study No. TPF-5 (013)

**Lead State:** Pennsylvania Department of Transportation

**Established:** 3/4/03

**Estimated Completion Date:** 9/4/05

**AKDOT&PF Contribution:** \$20,000

**AKDOT&PF Technical Contact:** Steve Saboundjian

#### **Research Objectives**

The general objective of the pooled-fund study is to quantify the effect of seasonal frost penetration on the rate of loss of pavement performance for environments where deep, sustained frost penetration occurs, AND for environments where multiple shallow freeze-thaw cycles occur.

The extent to which local adaptations of materials standards and pavement thickness designs have compensated for and/or mitigated the effect of seasonal frost penetration should be established.

Determine financial impacts associated with freeze-thaw mitigation in the construction and rehabilitation of pavements.

#### **Status**

Study panel met in January 2005. Detailed statistical analysis was conducted. The data test was reviewed to identify outliers. Transformations were performed on the data to improve the validity of the models.

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### **Computer-based Self-operating Training System on Anti-icing/Road Weather Information**

**Project Number:** FHWA Proj. No. TPF-5 (009) and SPR-3 (104)

**Lead State:** Iowa Department of Transportation

**Established:** 12/00

**Estimated Completion Date:** Not Determined



## POOLED FUND STUDIES

**AKDOT&PF Contribution:** \$30,000 from AKDOT&PF Intelligent Transportation Systems Program and Maintenance & Operations

**AKDOT&PF Technical Contact:** Frank Richards, Statewide M&O

### Research Objectives

Anti-icing and road weather information systems (AI/RWIS) are relatively new tools that improve the efficiency of winter storm maintenance and, as a result, improve highway safety.

Because these are new concepts, standard training programs for all levels of AI/RWIS users are not yet available. This project will coordinate and leverage several individual training and educational initiatives into one consistent training program for AI/RWIS.

### Status

Development of the customized software training packages started in the fall of 2001 and are nearing completion. A beta customization has been delivered to Alaska. See the website for the Snow and Ice Pooled Fund Cooperative Program

- [www.sicop.net](http://www.sicop.net)

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### **Western Alliance for Quality Transportation Construction (WAQTC)**

**Project Number:** FHWA Proj. No. TPF-5(064)

**Lead State:** Alaska Department of Transportation & Public Facilities

**Established:** December, 2002

**Estimated Completion Date:** 2007

**AKDOT&PF Contribution:** \$0

**AKDOT&PF Technical Contact:** Michael SanAngelo, P.E., Statewide Materials Engineer

### Background

In the mid 1990's, several western state and federal highway agencies recognized the need to have qualified materials test technicians and laboratories conducting acceptance testing on materials purchased and incorporated into transportation facilities. This loose organization of highway agencies formed the Northwest Alliance for Quality Transportation Construction (NAQTC), which produced five technician-training and qualification modules for use within their organizations. Since materials testing procedures vary little from state to state, the NAQTC determined that all highway agencies in the western United States would benefit from a united effort. The NAQTC invited all WASHTO states to join their organization. Eventually, 7 additional state highway agencies joined the NAQTC to form the Western Alliance for Quality Transportation Construction or WAQTC.

The WAQTC is actively seeking to expand beyond the current member agencies consisting of state departments of transportation and FHWA agencies: Alaska, Arizona, Colorado, Hawaii, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and FHWA Western & Central Federal Lands Highway Departments are currently members. The WAQTC is dedicated to improving the quality of transportation products and services through a comprehensive Technician Training and Qualification Program (TTQP).

### Research Objectives

To support the development and refinement of a training and qualification program for construction inspection and materials testing technicians by the Western Alliance for Quality Transportation Construction (WAQTC), a cooperative technology transfer effort of multiple western states and FHWA.

### Status

AKDOT&PF is beginning work on the study.





## POOLED FUND STUDIES

### Long-Term Maintenance of Load and Resistance Factor Design Specifications

**Project Number:** FHWA Proj. No. TPF-5(068)

**Lead State:** Iowa Department of Transportation

**Established:** 2002

**Estimated Completion Date:** 2006

**AKDOT&PF Contribution:** \$20,000

**AKDOT&PF Technical Contact:** Elmer Marx, Bridge Design Section

**Background:** In cooperation with AASHTO the FHWA has proposed that by 2007 all of the states utilizing the “Standard Specification for Highway Bridges” move to the LRFD method. As the LRFD Specifications are put into use by the states and others, there will be a need for technical and editorial corrections, clarifications, and potential additions resulting from practice and research studies.

### **Objectives**

The objective of this project is to provide timely assistance to the AASHTO Highway Subcommittee on Bridges and Structures in implementing, revising, and refining the AASHTO Bridge Load Resistance Factor documents.

### **Status**

Ongoing. Quarterly progress report published at:  
[www.pooledfund.org](http://www.pooledfund.org)

### Portable Non-Intrusive Technologies

**Project Number:** FHWA Proj. No. TPF-5(073)

**Lead State:** Minnesota Department of Transportation

**Established:** 2002

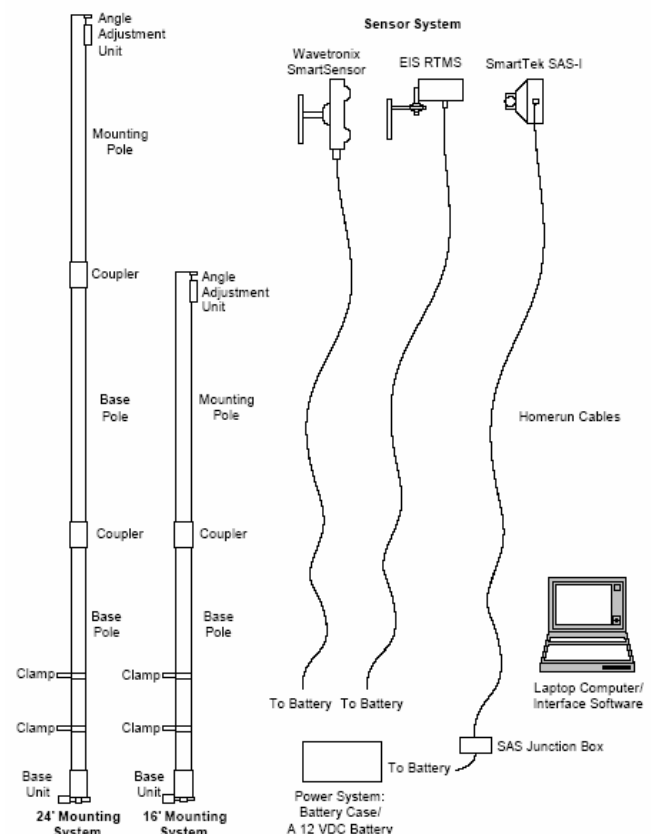
**Estimated Completion Date:** September, 2005

**AKDOT&PF Contribution:** \$20,000

**AKDOT&PF Technical Contact:** Mary Ann Dierckman, Planning/Traffic

### **Background**

Many metropolitan areas have high volume roadways that make the placement of conventional detectors not only difficult, but also unsafe for personnel. Non-intrusive technologies offer an alternative to conventional traffic data collectors, such as road tubes, by detecting traffic above or to the side of the roadway. A Non-Intrusive Traffic Detection System (PNITDS) can monitor traffic on multi-lane, high volume facilities without exposing personnel to traffic.





## POOLED FUND STUDIES

### Objectives

The primary goal of this project is to provide data collection practitioners with a cost-effective design of a PNITDS and an independent assessment of a variety of detection technologies.

Researchers will design, build, and evaluate a pole-mounted PNITDS capable of detecting traffic in multiple lanes under various conditions without exposing personnel to traffic. Both the sensors and the portable concept itself will be assessed for their ability to perform temporary data collection functions.

### Status

- ◆ Presented test results in 2004 Rural ITS conference (Duluth, MN)
- ◆ Posted test results on PNITDS website (<http://projects.dot.state.mn.us/nit>)
- ◆ Conducted site demonstration to participating states.

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### Electronic Appraisal Development Study – Phase 1

**Project Number:** FHWA Proj. No. TPF-5(087)

**Lead State:** Texas Department of Transportation

**Established:** 2003

**Estimated Completion Date:** August, 2006

**AKDOT&PF Contribution:** \$10,000

**AKDOT&PF Technical Contact:** Rick Kauzlarich, AKDOT&PF Southeast Region Right-of-Way Chief

### Objectives

Develop and deliver a "How To" manual of instruction for the electronic transmittal of Real Estate appraisal documents (appraisals, data books, and review appraiser reports). The

manual should describe alternative options for implementation, listing pros and cons to each alternative, with recommendations for each participating state agency regarding respective hardware and software requirements.

### Status

Researchers have made significant progress towards identifying the key components that are essential for conceptualizing, prototyping, developing, and implementing an Electronic Appraisal System (EAS):

- ◆ Representatives from nearly all of the participating states shared their state's experiences with the right-of-way appraisal process and expressed their desires for the proposed EAS.
- ◆ The Research Team has successfully crafted the conceptual framework and developed a list of potential user functional needs for the proposed EAS.
- ◆ Work continues on developing a list of data needs for a standardized electronic appraisal form.

Participating state DOTs will soon receive:

- 1) Copy of the conceptual framework
- 2) List of user functional needs for review and/or ranking.

Using the Delphi Process (a structured method for developing consensus among participants in a manner that reduces bias), researchers will incorporate the input of each of the participating state DOTs and prioritize user needs.



# EXPERIMENTAL FEATURES

## Experimental Features Program

**Project Coordinator:** Clint Adler

### **Program Description**

This program enables federal highway construction funds to be used for promising but unproven materials, methods, and techniques where such use of federal funds would not normally be allowed. Statewide Research coordinates with the Federal Highway Administration's Experimental Features in Construction Program, which encourages innovations in state highway design and construction. The program provides federal funds for new and unproven features. Funding for each experimental feature is included in the construction project; usually, the feature is designated in the bid schedule as a separate bid item. Funding for monitoring the feature comes from the Experimental Features Program, not from construction dollars. If the experimental feature fails, repair or replacement costs are also eligible for federal aid funds.

There are essentially two criteria for an innovation to qualify as an experimental feature.

- It must have potential benefits for DOT&PF or the public.
- Use of the feature must be followed up with an evaluation of its success, along with recommendations for its use in the future. Experimental features can be a new process or technique for using conventional materials and equipment.

The Department supports use of this program to encourage innovation in highway construction in general, and specifically as a means for full-scale demonstrations of concepts developed in the research program. Costs of experimental features and evaluations of those features are

typically paid for with construction funding.

Statewide Research staff assist Department staff in developing evaluation plans, coordinate program activities with the FHWA, fund evaluation activities that extend beyond the construction phase of a project, and compile and disseminate results.



## EXPERIMENTAL FEATURES

### **Active Projects**

#### **AK 99-03. Rockfall Barrier Mitigation Using Steel Bin Walls and Reinforced Concrete - I-OA4-4(5) Parks Highway, Nenana Canyon Erosion**

**Purpose:** evaluate the effectiveness of placing movable rockfall barrier sections along the slide area.

**Anticipated benefits:** protecting the passing traffic and the roadway structure, and providing a safe means for the maintenance personnel to remove the slide debris.

**Available Reports:** A Final report is available.

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#### **AK 01-02 Design, Simulation, and Monitoring of Ventilated Shoulder Design Features for the Loftus Road Extension-STP-0002(90) Intersection of Geist and Loftus Road to Tanana Loop, Fairbanks, See also research project # T2-02-04: Eliminating Longitudinal Cracking**

**Purpose:** evaluate the effectiveness of insulation, thermosyphons, and Air Cooled Embankments and bridge abutments, in Alaska's interior region of discontinuous permafrost.

**Anticipated benefits:** Demonstration of new technologies for stabilizing permafrost beneath roadways.



## Technology Transfer Program Support

**Project Number:** 01-06

**Completion Date:** 12/31/04

**Program Budget:** \$280,000

**Project Manager:** Dave Waldo

### **Program Description**

The Local Technical Assistance Program (LTAP) is Alaska's transportation training and information outreach for state and local governments.

LTAP is a national network of centers funded by FHWA. Each LTAP center adapts its program to address the unique challenges faced by the customers it serves. LTAP provides local agencies with a variety of tools:

- Training events
- Technology Transfer resources
- Personalized technical assistance

### **Required Work Products**

Alaska's annual work plan and budget tasks include:

- publish a quarterly newsletter;
- serve as a clearinghouse for local transportation agencies to obtain publications, video tapes, and other technology resource documents, such as manuals and field guides;
- maintain a comprehensive, up-to-date mailing list of rural and local officials having transportation responsibilities;
- conduct at least 10 training courses per year for local transportation agencies;
- provide information on new and existing technology; and

- perform an annual self-evaluation.

### **Advisory Board**

Alaska Technology Transfer's advisory board provides guidance and program evaluation. The Board is comprised of representatives in state, local, and federal agencies from across Alaska and Canada.

- *Billy Connor*, Research Manager, DOT& PF
- *Chris Haigh*, City Engineer, City of Fairbanks
- *Jacob Kagak*, Municipal Services Director, North Slope Borough
- *Jack Fullerton*, Central Region Maintenance Chief, DOT&PF
- *Robin Walsh*, Yukon Government Transportation
- *Trent Mackey*, Service Area Engineer, Fairbanks North Star Borough
- *Joe Buck*, Public Works Director, Juneau City and Borough
- *Lee Coop*, Assistant Traffic Engineer, Municipality of Anchorage
- *Don Shiesl*, Public Works Director, Mat-Su Borough
- *Keith Kornelis*, Public Works Director, Kenai Peninsula Borough
- *Steve Boch*, Structures/Research Engineer, FHWA





## Local Technical Assistance Program—Technology Transfer 2004

During 2004, Alaska LTAP offered thirty-two training events in seventy-five training sessions, in many locations around Alaska. This resulted in 1576 participants trained from DOT&PF, local government, and other transportation agencies.

### **Completed training:**

- Fall Protection—Bridge
- Fall Protection—Construction
- Grader Operator
- Traffic Control Technician
- Traffic Control Supervisor
- Alaska Flexible Pavement Design
- Highway Traffic Noise
- Intro to Condition Acquisition & Reporting
- Maintaining Safe Roadsides
- Pedestrian Facility Design
- Bicycle Facility Design
- Road Safety Audits
- Road Safety Analysis Program
- Synchro Simms/Traffic I & II
- Design— Build Contracting
- Context Sensitive Solutions
- Construction Cost Engineering
- Access Management Location and Design
- Highway Specifications and Review
- HMA Construction
- HMA Evaluation and Rehab
- NEPA and Transportation Disclaiming Making
- Functional Assessment of Wetlands
- Conducting Reviews that Get Results
- Scheduling for Construction
- Alaska Engineering & ITS
- Trenchless Pipe Rehab

- Copper River Consent Decree
- Civil Rights Title VI/DBE
- Alaska State Accounting System
- Alaska Summer Research Academy
- Writing that Works

### **Other Activities:**

- Co-sponsored the Alaska Summer Research Academy. A residential camp for high school students. This year the student team created a conceptual design for a walking path around the Fairbanks Pioneers' Home.
- Participated in the creation of a statewide safety manual for Alaska DOT & PF.
- Managing the Operator Certification and Evaluation Program for statewide DOT M&O. The goal is to evaluate operators on graders, loaders, dozers, plow trucks, and blowers to reduce cost to damage equipment and improve safety.
- T2 is taking the lead on converting our materials testing training (WAQTC-TTQP) to computer based modules to reduce training cost and maximize employee time.
- Produced four quarterly newsletters
- Continually update the training web page with new training and registrations; update the Research page with new reports
- LTAP/T2 Publication Library continues to be managed by Mather Library at the Geophysical Institute. Collection continues to expand.
- Video, CD-Rom, software, and research publications available through online catalog with most publications downloadable in .pdf format – on going update and cataloging of new acquisitions
- Participated in UAF Career Expo with booth highlighting engineering career opportunities
- Assisted in set-up of booth at Tanana Valley State Fair with the transportation theme.



## Local Technical Assistance Program—Technology Transfer 2003

During 2003, Alaska LTAP offered thirty-two training events in sixty-two training sessions, in many locations around Alaska. This resulted in 1513 employees trained from DOT&PF, local government, and other transportation agencies.

### **Completed training:**

- Fundamentals of Geometric Design
- Basics of a Good Gravel Road
- NHI: Federal Aid Highways 101
- Liquid Penetrant Testing
- Grader Operator Training - Intermediate
- ATSSA: Traffic Control Technician
- ATSSA: Traffic Control Supervisor
- ITS Standards
- NHI: ITS Deployment Analysis System
- Alaska Traffic Manual/MUTCD Training
- LRFD-Bridge Design
- NHI: Traffic Calming: Basics and Beyond
- ATSSA: Flagger Training
- NHI: Introduction to Highway Hydraulics
- Fall Protection Training
- NEPA & Environmental Documentation
- Life Cycle Cost Analysis
- Introduction to Systems Engineering
- Safety Conscious Work Environment/Protected Activities
- Elmod 5 Training
- Road Weather Information Systems – User Training
- NHI: Surface Water Modeling
- Bioengineered Streambank Stabilization Summary
- NHI: HMA Evaluation & Rehabilitation
- Warrant Level 1 – AK Rules & Regulations
- Warrant Level 2 – Contract Administration
- Warrant Level 3 - Negotiations
- Warrant Level 4 - Contract Law I
- Warrant Level 6 – Contract Law II
- AASHTO Leadership Academy
- Alaska Pavement Summit

### **Other Activities:**

- Produced four quarterly newsletters
- Continually update the training web page with new training and registrations; update the Research page with new reports
- LTAP/T2 Publication Library continues to be managed by Mather Library at the Geophysical Institute. Collection continues to expand.
- Video, CD-Rom, software, and research publications available through online catalog with most publications downloadable in .pdf format – on going update and cataloging of new acquisitions
- Participated in UAF Career Expo with booth highlighting engineering career opportunities
- Assisted in set-up of booth at Tanana Valley State Fair with the transportation theme. Photo opportunity for kids to be “honorary flagger”
- Assisted with the coordination and planning for the annual Pavement Summit
- Presented T2 services and available resource to Yukon transportation employees during their Yukon Maintenance Conference
- Outlined T2 library resources to TTAP members during a local TTAP roads meeting
- Co-sponsored the Alaska Summer Research Academy. A residential camp for high school students - provided transportation engineering related activities



- Grader Operator Training—Nome



## National Highway Institute (NHI)

**Project Number:** 01-06

**Completion Date:** 12/31/04

**Program Budget:** \$483,000

**Project Manager:** Dave Waldo

### **Program Description**

NHI is FHWA's technical training organization and outreach program to state highway agencies. NHI administers training programs reaching over 15,000 state highway agency people each year. It also works with approximately 550 universities nationwide to administer educational programs that attract students to the field of transportation. States receive technical training produced by NHI and taught by NHI contract instructors or FHWA employees. States receive a certain allocation of their annual budget to provide education and training activities under the NHI umbrella.

NHI funding provides AK DOT & PF transportation related education programs to improve the quality of the state's highway system by

- enhancing economic growth
- improving public safety and quality of life.
- promoting environmental stewardship.

This is accomplished by applying new technologies to the planning, design, construction, maintenance and rehabilitation of Alaska's transportation infrastructure.

NHI provides technical training in the following areas:

- Structures
- Materials, Pavements, and Base Design
- Geotechnical
- Design and Traffic Operations
- Construction and Maintenance

- Hydraulics
- Intelligent Transportation Systems
- Real Estate
- Environmental
- Statewide Planning
- Civil Rights
- Highway Safety

### **NHI Training at Alaska DOT&PF**

Alaska DOT&PF Research and Technology Transfer houses several training programs and has opted to make all training open to all of its customers rather than limiting participants to training according to program. Because class participants come from local government, DOT&PF, and consultants and contractors, we leverage training dollars by combining funds. NHI and LTAP fund a pro-rata share of the annual training budget based on participant status.

### **Program Status**

For a list of training presented to date, including 2003 and 2004 (see pages 65-66 in the LTAP section)

Alaska DOT & PF Research & Technology Transfer manages several training programs open to all transportation customers and funded through appropriate sources on a pro-rata bases. Result:

- Leverages funding
- Avoids duplication of service
- Provides a forum for communication between cities and boroughs, DOT & PF, consultants, and contractors.



## **Border Technology Exchange Program (BTEP)**

**Project Number:** 01-06

**Estimated Completion Date:** 12/31/04

**Estimated Cost:** \$15,000

**Project Manager:** Dave Waldo

### **Project Description**

The Border Technology Exchange Program, or BTEP, is an initiative of FHWA's International Programs Branch. It came about because the North American Free Trade Agreement (NAFTA), which expanded potential for trade with border countries, did not address the transportation infrastructure impacts of increased trade. NAFTA also failed to address the aspects of new working relationships required to advance transportation projects and systems under a free trade environment. FHWA designed BTEP to enhance and expand binational working relationships and to create the opportunity for transportation officials to improve the planning, design, construction, and operation of land transportation facilities.

### **Project Objectives**

In Alaska, the BTEP exchange is with the Yukon Government Transportation in Canada. BTEP formalizes and funds several unofficial information exchanges on design, construction, and mitigation techniques for

- asphalts.
- permafrost issues.
- new structure designs.
- other cold region engineering problems.

BTEP provides the opportunity to expand the transportation knowledge base of both countries. Since Alaska DOT&PF and the YGT both work with cold regions engineering problems, both

have similar design, construction, and maintenance difficulties and should share problems, solutions, and successes.

### **Activities in 2004**

- BTEP funds Robin Walsh's participation at LTAP advisory board meeting and Pavement Summit.
- DOT&PF staff attended the Yukon Transportation Maintenance annual conference in Whitehorse.
- Provide materials, publications, CDs, videos as requested to Canadian Transportation workers.
- Provided Flexible Pavement Design Software Training in Whitehorse to Yukon Government Transportation.

